EXHIBIT 208

Michael Dorn's Report of Opinions

Concerning:

San Francisco Unified School District, California

v.

JUUL Labs, Inc. et al.

No. 3:19-cv-08177 (MDL No. 3:19-md-02913-WHO)

January 28, 2022, as amended August 19, 2022

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Michael Dorn

HIGHLY CONFIDENTIAL

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Rule 26 Expert Report of Michael S. Dorn

The following report is provided pursuant to the Federal Rules of Civil Procedure Rule 26. All the opinions I offer herein I hold to a reasonable degree of professional or scientific certainty within the field of school safety, security, climate and culture and, more probably than not, are necessary to significantly reduce or eliminate the problem of student e-cigarette use in San Francisco Unified School District, California. The materials that I have relied on in forming my opinions in this report are included in this report and/or are listed in Appendices I and II. My curriculum vitae is attached as Appendix III. My testimony history is attached as Appendix IV.

This report summarizes my knowledge, education, expertise, experience, and leadership in the field of school safety, security, climate, and culture. This report also presents background information and my opinions on the problem of student e-cigarette use in San Francisco Unified School District, California, and my recommendations for a comprehensive and multi-disciplinary strategy tailored for the conditions at this District that will more likely than not significantly and effectively deter student e-cigarette use at school and will enable school officials to detect and identify those students who are not deterred because of their addiction to nicotine so they can be provided with effective support and treatment as recommended by appropriate experts.

1. Qualifications

Summary of School Safety Experience and Credentials

My CV can be found in Appendix III, and sets forth a detailed description of my education, training, experience, and qualifications. Below is a summary of certain information related to my experience that is of particular relevance to the issues in this report.

I serve as the Executive Director of Safe Havens International, Inc., a global non-profit K12 focused school safety center that I co-founded. During my more than 41 years of full-time campus safety and homeland security work experience, my school safety work has taken me to 48 states and eleven countries in North America, Central America, Europe, Asia, the Subcontinent, and the Middle East. I have authored, co-authored, and served as a contributing author for more than two dozen books on school safety and public safety. My latest book, *Extreme Violence – Understanding and Protecting People from Active Assailants, Hate Crimes and Terrorist Attacks* is a 494-page university textbook which was published by Cognella Academic Press in January 2021. I have also authored and co-authored hundreds of blogs, feature articles, journal articles and columns for publications including *Campus Safety Magazine, Police Chief, Law and Order, the Journal of Emergency Management, School Planning and Management, Todays School,* and other national publications.

I began my career at the age of 18 as Mercer University police officer and was promoted to police corporal at the age of 19, sergeant at the age of 21 and lieutenant at the age of 25. I was appointed as the police chief for the Bibb County Public School System at the age of 27 and, ten years later, left to accept an appointment as the lead expert for what was at the time the nation's largest state government school safety center – the School Safety Project of the Georgia Emergency Management Agency – Office of the Governor. I was recruited after an international search for what they described as

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"the world's top school safety expert" to serve as the Senior Consultant for Public Safety and Emergency Management for Jane's Consultancy (also often referred to as Jane's Defense or Jane's Information Group) for Jane's offices in nine countries. I have served as the Executive Director of Safe Havens International since its inception more than 20 years ago.

A graduate of the 181st session of the FBI National Academy, I also received a fellowship from Georgia State University to receive advanced anti-terrorism training in Israel as a delegate with the Georgia International Law Enforcement Exchange Program (GILEE) and have completed more than 18 months of formal law enforcement, fire service and emergency management training. I have completed the Advanced Russian Immersion Language Program at Dartmouth College and have a Bachelor of Arts degree with a double major in history and political science from Mercer University and a master's degree from the Mercer University School of Business.

As detailed in my CV and later in this report, I have extensive experience in prevention and detection of student conduct and safety violations relating to various types of contraband. This experience includes, among other things: helping script, direct, edit and appear in a variety of training videos focused on techniques to improve deterrence and detection of student weapons and drug violations; developing and delivering training programs, consulting with school districts and state and federal government agencies on methods to help prevent and detect student weapons and drug violations (including tobacco, alcohol, street drugs and prescription medications); and working as a practitioner in a K12 school district to significantly reduce problems relating to a wide variety of types of concealed contraband violations including tobacco and other drugs.

I regularly keynote, endnote or provide plenary sessions at major conferences such as the International Bullying Prevention Conference, Crisis Prevention Institute National School Safety Conference in Toronto, Canada, International Conference on Safe School Design, National Association of Pupil Transportation, National Association of School Security and Law Enforcement Administrators, National Association of School Resource Officers, Campus Safety Magazine conferences, the International Association of Campus Law Enforcement Administrators Annual Conference in Quebec City, Canada, the National SCAPES School Architecture Conference, and the first and second national school violence prevention conferences held in Trinidad-Tobago. I have also presented for the FBI National Academy, the U.S. Department of Education, the U.S. Department of Homeland Security, the Bureau of Alcohol, Tobacco and Firearms and several dozen state departments of education, law enforcement, emergency management and homeland security. I have provided training to two groups of ranking personnel from the Israel National Police through the Georgia State University GILEE Program.

I have lectured at a variety of institutions of higher education including: the College of Architecture – Texas Tech University, Illinois State University, Ohio State University, Michigan State University, the Mercer University College of Education, the Mercer University Walter F. George School of Law, Montana State University - Bozeman, Purdue University, the University of Tennessee at Chattanooga School of Nursing, the Sanford School of Medicine – University of South Dakota, Vietnam National University in Saigon, Vietnam, the University of Wisconsin – Madison School of Architecture and Urban Planning and to medical doctors, nurses and other health care professionals at Women's Hospital in Baton Rouge, Louisiana.

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I have worked on many large school safety projects for more than 60 state, national and international agencies and organizations. I have worked on more than 50 Readiness and Emergency Management for Schools (REMS) and Safe Schools/Healthy Students grant projects and served on the working group that helped the United States Department of Education develop its first school safety planning guide - Practical Information on Crisis Planning–A Guide for Schools and Communities.   I have also served as a presenter, consultant or technical advisor for many organizations concerned with school safety including more than 30 state departments of education, law enforcement, homeland security and emergency management. I have presented for or otherwise assisted the National Education Association, the National Safety Council, the International Association of Chiefs of Police, the National Sheriff's Association, the International Association of Emergency Managers, the United States Departments of Education, Justice and Homeland Security, the U.S. Attorney General's Office, the Bureau of Alcohol Tobacco Firearms Enforcement, the United States Army, the United States Navy, the Ministry of Education of Trinidad-Tobago, the Government of Poland and the Department of Education of India. I co-authored the IS360 Preparing for Mass Casualty Incidents: A Guide for Schools, Higher Education, and Houses of Worship for the United States Department of Homeland Security as part of President Barak Obama's 2013 White House School Safety Initiative.

I have extensive experience in the prevention of and preparedness for extreme violence including active assailant, hate crimes and terrorist attacks which inherently involve concerns about the preattack concealment of a wide variety of weapons including but not limited to firearms, edged weapons, flammable liquids, and caustic chemicals such as battery acid and explosives. I have been personally involved in successful efforts to thwart otherwise imminent school shootings and a planned bombing targeting African American middle school students by a student who espoused Nazi ideologies. I have extensive field experience in successfully detecting concealed contraband including unlawfully possessed firearms, edged weapons, street drugs, tobacco, and beverage alcohol in both the higher education and K12 setting. I helped develop and implement a highly successful program to reduce violence, student weapons violations, student possession and use of tobacco, beverage alcohol and street drugs in a K12 school district with approximately 25,000 students. These successful efforts resulted in hundreds of requests for assistance and training from school systems, law enforcement agencies and state and federal government agencies from across the United States. The program was so successful that it was recognized and cited by a number of national organizations including the United States Department of Education, U.S. Attorney General Janet Reno, the International Association of Chiefs of Police, the Bureau of Alcohol, Tobacco and Firearms, the National Association of School Resource Officers and was selected as a field training site by the United States Department of Justice which flew multiple groups of school and law enforcement officials to our community to observe our programs and techniques in use.

I have provided different forms of post-incident assistance for 23 targeted school shootings and active assailant attacks at U.S., Canadian and Mexican K12 schools. These incidents include several of the nation's most deadly K12 school shootings to date. I led the team that conducted the assessment of the Danbury Connecticut School System (Danbury is the county seat of Newtown) after the Sandy Hook Elementary School shooting which is the deadliest U.S. K12 school shooting at the time of this writing. I also led a team of 23 analysts to conduct a school security, climate, culture and emergency preparedness assessment for the Broward County, Florida School System in the aftermath of the deadly

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shooting at Marjory-Stoneman Douglas High School in Parkland, Florida on February 14, 2018. This deep assessment involved more than 1,000 separate site visits to 234 schools and 21 support facilities, interviews of more than 3,000 employees and more than 2,500 one-on-one controlled real-time school crisis video and audio simulations by Safe Havens analysts.

I also provided post-incident assistance for a Christian school in Nairobi, Kenya after the deadly terrorist attack at the West Gate Mall where a number of the school's students, parents and a teacher on a field trip were targeted during the attack. I completed a security assessment of the school which educates the children of employees of 12 embassies and the United Nations, after the school was ranked as the number one soft target for terrorism in Nairobi after a U.S. State Department national security assessment of Kenya that was conducted as a result of this attack. To provide context for the extreme threat level at this school identified by the U.S. State Department, the assessment I conducted was the sixth security assessment conducted at the school that year with prior assessments by government security professionals from four countries and the United Nations. The school has not been successfully targeted for a terrorist attack since the assessment I conducted.

I have extensive experience conducting and coordinating school safety, security, climate, culture, and emergency preparedness assessments for public, private, charter, faith-based, independent, boarding, and international schools. I have assisted with assessments for an estimated 8,500 K12 schools and support facilities across the United States, Canada, Trinidad-Tobago, Kenya, South Africa, India, and Vietnam. These projects include assessments for six of the nation's top fifteen largest school districts as well as large, mid-sized and small school districts. I have also provided advanced training sessions on how to conduct school safety, security, climate, culture, and emergency preparedness assessments of K12 schools to more than 2,000 school and public safety officials and have helped develop state-wide assessment processes for government agencies in Georgia, Hawaii, Indiana, Maine, Pennsylvania and Wisconsin and have trained private sector personnel in India on how to conduct these types of assessments.

I have been interviewed by and/or featured by numerous media organizations, magazines, radio and television shows including: *ABC, Al Jazeera America, Associated Press, Anderson Cooper, BBC, Bao Tuoi Tre (National Youth Magazine of Vietnam), Boy's Life, Canadian Public Radio, Christian Science Monitor, CNN, Dr. Phil, Education Week, Fox, Good Morning America, Hannity, Huffington Post, LA Times, London Times, MSNBC, New York Times, NPR, John Tesh, Reuters, Time Magazine, Time Magazine Asia Edition, Univision, United Press International, Wall Street Journal, Washington Post, Tokyo Broadcasting, and 20/20.*

About Safe Havens International, Inc.

Formed in 2001, Safe Havens International, Inc. (Safe Havens) is a Georgia-based non-profit K12 school safety center. The work experience of Safe Havens analysts in all 50 states in the U.S. and more than two dozen other countries provides clients with a high degree of K12 specific expertise. More than 95% of Safe Havens work is with K12 schools. Utilizing a comprehensive all-hazards approach, Safe Havens has assisted with comprehensive school safety, security, climate, culture, and emergency preparedness assessments for more than 8,500 K12 schools.

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While Safe Havens is extremely experienced in addressing school violence, the organization also focuses on many other critical areas of school safety. For example, most fatalities on K12 school campuses in the United States are unrelated to violence so Safe Havens uses comprehensive approaches to address a much wider variety of school safety challenges. In addition to life-safety issues, there are many other negative safety, climate and culture situations that impact how effectively schools can educate students and foster a school climate where students can learn more effectively. Of particular relevance to this litigation, Safe Havens has considerable experience in the prevention and detection of substance abuse relating to alcohol, tobacco and other drugs which includes the increasing problems related to "vaping" along with other high-risk behaviors in the K12 setting.

Safe Havens has extensive experience working on complex high-stakes school safety projects with a state, national and in some cases, an international impact. The following are but a few examples that illustrate the breadth and depth of Safe Havens experience working in the area of K12 school safety concerns:

- Safe Havens was selected to conduct school safety, security, climate, culture, and emergency preparedness assessments for 234 schools and 21 support facilities operated by the School Board of Broward County (SBBC). This decision was made in the wake of the nation's second most deadly K12 school shooting, which occurred at one of the district's high schools – Marjory Stoneman Douglas High School. This project constituted the most thorough and comprehensive school safety, security, climate, culture and emergency preparedness assessments following a mass casualty school shooting in the nation to date. More than 14,000 pages of reports were produced for this project including a report for each school, multiple district-level reports, review of school construction and renovation design specifications, and reviews of safety, security, and law enforcement staffing. This included recommendations for new job descriptions, screening, training, supervision and tasking of numerous Campus Monitors, School Security Specialists, Armed Safe School Officers, School District Police Investigators, and local law enforcement personnel assigned to district schools as school resource officers. Safe Havens work on this project also included developing detailed cost estimates for over $500 million in security upgrades for the district. Safe Havens analysts also assisted the district's facilities planning team and architecture firm in designing the safety, security, climate, and emergency preparedness features for the new replacement building for Building 12 (the building where 17 victims had been murdered in the February 14, 2018, attack) which had been ordered sealed by the prosecutor's office until all criminal proceedings and any appeals involving the accused killer had been exhausted.

  As part of the assessment, Safe Havens also reviewed hundreds of millions of dollars of other potential school safety upgrades that the SBBC had been urged to adopt by various parties. The assessment determined that many of these suggested upgrades would be ineffective, unreliable, impractical and in some cases, unsafe. This evaluation included a review and analysis of hundreds of suggested potential school safety approaches recommended by a variety of stakeholders and external groups including parents and government agencies in report documents such as the Federal Commission on School Safety Report, the Marjory Stoneman Douglas High School Public Safety Commission Initial Report, the Broward County League of

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Cities' School and Public Safety Task Force Initial Report and Recommendations, as well as other suggestions from a variety of other groups that provided recommendations. The school board extended Safe Havens' contract twice so we could further assist them with developing new emergency plans, security procedures, training programs, web courses and other school safety initiatives.

- Over more than twenty years, Safe Havens has assisted five of the other largest public-school systems in the nation with school safety, security, climate, culture, and emergency preparedness assessment projects including the Orange County Public Schools (Florida), Hillsborough County Public Schools (Florida), Clark County School District (Nevada), the School District of Philadelphia (Pennsylvania), and the Hawaii Department of Education – the only state-run school district in America.

- Safe Havens was selected to develop the content for the United States Department of Homeland Security web course *IS-0360: Preparing for Mass Casualty Incidents: A Guide for Schools, Higher Education, and Houses of Worship program* as part of the 2013 White House School Safety Initiative. This course was developed in response to the nation's most deadly school shooting to date – the 2012 attack at Sandy Hook Elementary School.

- Safe Havens has also developed state-wide school safety, security, climate, culture and preparedness training and assessment processes and programs for the Hawaii Department of Education, the Indiana Department of Education, the Maine Department of Education, the Pennsylvania Department of Education, and the Wisconsin Homeland Security Counsel.

- Safe Havens also worked with the National Sheriff's Association to develop the criteria for a national school safety self-assessment and recognition process under a United States Justice Department grant in 2021.

Of particular relevance to the issues I analyzed and provided recommendations and opinions on in this litigation, Safe Havens has extensive experience in the following areas:

- Preventing most types of student-related safety incidents, including substance abuse at schools, on school buses, at school athletic events and during after-hours events. One extremely important aspect of these efforts involves strategies to reduce the risk of harm including fatalities from intentional and accidental overdoses of beverage alcohol, prescription medications and street drugs.

- Evaluating and improving student supervision to help prevent student-related safety incidents, including substance abuse and other prohibited behaviors.

- Evaluating the effective and appropriate use of a wide variety of security technologies, including but not limited to smart cameras, analytic audio, and video software, smoking and vaping detection units, metal detectors, security X-ray equipment, alarm systems, visitor management systems, and access control systems, in schools, at athletic venues and on school buses.

- Assisting architects, engineers, and school planners in determining effective physical upgrades such as parabolic mirrors, addition of windows, magnetic holdback devices for doors,

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renovations of entryways, restrooms, locker rooms, stairwells, and other areas to improve the ability of school officials to monitor difficult to supervise areas.

- Analyzing and recommending school design features that can reduce supervision gaps – such as difficult to supervise areas -- where student misconduct including sexual misconduct, vandalism and as particularly relevant to this litigation, to help prevent the use of alcohol and other substances including street drugs and tobacco by students.

- Assisting a wide variety of vendors in developing new school safety hardware, software, and technology and/or improving existing products. For example, Safe Havens analysts have offered a variety of suggestions to engineers and other personnel from one of the nation's largest security technology integrators in their analysis and development of new concepts for video analytics to help address challenges relating to possession and use of contraband on K12 school campuses. These include the use of existing and/or new analytics to help school officials improve student supervision as well as the use of analytics to detect certain behaviors by students using smart camera as well as video and audio analytic technologies.

- Cost estimating for school safety and security upgrades in school prevention and mitigation measures for school districts, including, as examples, creating new and additional personnel, staff training approaches, upgrades of technology, and infrastructure upgrades required to properly leverage technology such as smart cameras and analytic detection software.

- Authoring content for dozens of school safety web-courses for one of the largest school safety web training providers in the U.S.

- Producing training videos and audios on school safety, security and emergency preparedness including substance abuse at schools and consulting and training videos on contraband concealment and detection for school, law enforcement, mental health, intelligence, commercial aviation, and other organizations around the world. A small sampling of some organizations that we have provided training for and/or who use Safe Havens videos such as *Secrets of the Drug Violator Exposed* and *Secrets of the Weapons Violator Exposed* includes:

  o The United States Department of Education

  o The Ministry of Education in Trinidad-Tobago

  o Government of India, Ministry of Human Resource Development - The Department of School and Literacy

  o The White House – Clinton Administration

  o United States Attorney General's Office – U.S. Attorney General Janet Reno's Administration

  o The FBI National Academy

  o The United States Secret Service

  o Office of Justice Programs

  o British Intelligence Services

- o   National Police of Israel
- o   Civil Aviation Authority of Vietnam
- o   The Transportation Security Administration
- o   The Texas Rangers

More than 60 full-time, part-time, and adjunct subject matter experts have provided school safety expertise on behalf of Safe Havens in technical areas including:

- Student wellness, mental health, public health planning, behavioral prevention, including evaluation of program effectiveness.

- Contraband concealment, detection, and prevention measures in the K12 setting

- Behavioral detection training

- School safety and security directors

- School district law enforcement supervisors, commanders, and police chiefs

- School system transportation directors

- School athletic event safety, security, and emergency preparedness

- Crime Prevention Through Environmental Design (CPTED) experts

- Architecture and school design

- School security technology, including infrastructure requirements needed to support security and detection systems

- Cost evaluation for upgrades of facilities and integration of school safety technology

I have served as the Executive Director for Safe Havens since its inception.

2. Assignment and Methodology

I was retained to review information and provide opinions regarding the civil action brought by San Francisco Unified School District, California ("SFUSD" or "District") against JUUL Labs, Inc. F/K/A PAX Labs, Inc. et al. (No. 3:19-cv-08177). I was asked to evaluate and opine on the following areas:

1. Identify and evaluate the challenges and impacts of student e-cigarette use (such as JUUL), or "vaping" at 31 secondary schools in SFUSD.

2. Identify and evaluate the effectiveness of the measures currently in place at SFUSD to prevent and address e-cigarette use by students on their school property.

3. Identify and evaluate necessary, practical, and sustainable prevention and intervention strategies that can be developed and customized to fit the local conditions to enable SFUSD to effectively prevent and address student use of e-cigarettes on school property.

My opinions in this case are based on but not limited to the following:

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1. The assessment conducted by Safe Havens focusing on student vaping at SFUSD schools ("Safe Havens' Assessment" – Section 6). As part of the project, Safe Havens was retained to conduct the assessment. I directed, participated in, and provided oversight for this assessment.

2. The documents and other data provided in Appendix I.

3. The research papers, articles, and other information relating to student e-cigarette use found during my independent research (Appendix II).

4. Media reports and videos about how students can try to use e-cigarettes without detection at school found through independent research.

5. A review of available technologies that can be utilized as part of a comprehensive, multi-disciplinary strategy to enable school districts to effectively prevent and intervene in e-cigarette use by students at schools.

6. Publicly available information regarding salary and benefits for various positions at the District.

7. My professional experience as a school safety practitioner and subject matter expert, formal training I have received, formal education, the lessons learned from the research conducted for my authoring activities during my more than four decade career in higher education and K12 campus law enforcement, state-level campus safety and homeland security experience, my work with Jane's Information Services (a global open-source intelligence company), and the experience I have gained working for a non-profit K12 school safety center as detailed in my CV (see Appendix III).

I am being compensated at the rate of $400 per hour for the work required to develop my opinions in this litigation regardless the outcome of the case. I do not have any direct or indirect financial interest in the outcome of this litigation.

3. Executive Summary

My name is Michael S. Dorn, and I am the Executive Director of Safe Havens International, Inc. ("Safe Havens"), a non-profit pre-K-20 school safety center whose analysts have worked internationally, and which is focused primarily on K12 school safety, security, climate, culture, and emergency preparedness. During my more than 40 years of full-time work experience in K-20 campus safety and homeland security, my work has taken me to eleven countries in Africa, Asia, the Caribbean, the Middle East, North, South and Central America, and the Subcontinent. I have published more than two dozen books and have keynoted state, national, and international professional conferences on school safety as detailed in my CV. I have been retained to review information and provide opinions regarding the civil action brought by SFUSD against JUUL Labs, Inc. F/K/A PAX Labs, Inc. et al. (No. 3:19-cv-08177).

As discussed in more detail in this report, I researched, reviewed and analyzed information to understand the nature of the problem of student e-cigarette use on school property. This included but is not limited to how and where students use e-cigarettes; the effect of student use of e-cigarettes on school safety, security, climate, and culture; the practices that schools have employed to try to address the issue of student use of e-cigarettes on school property ; and other potential strategies to help school

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officials combat the issue of e-cigarette use by students under their care. Based on my experience with other K12 school safety assessment projects and the results of my research and review, I then developed a comprehensive assessment process, participated in, and provided oversight for the assessment conducted by me and my team at Safe Havens to evaluate the impact of student e-cigarette use at all 31 secondary schools in SFUSD as well as the actions taken by the District to combat the issue at those schools. Finally, based on my review of information , the results of the assessment, and my relevant experience, I have formed opinions in this case.

I find that in order for SFUSD to properly and effectively prevent and address the problem of student e-cigarette use on school property, a comprehensive and multi-disciplinary strategy tailored to fit the local conditions of SFUSD is necessary. I have also determined what will be required for an effective and sustainable comprehensive and multi-disciplinary strategy. As with other challenging problems that I have assessed for public school districts across the nation (such as weapons, bullying, gang activity, and issues with other types of contraband), I note that it is important that the selection of specific types of technologies (such as cameras and vape sensors), staffing levels to support them, etc., must take into account the nature of the risk being addressed and the local conditions of each school and school district in order for the strategy to be effective.

As one example, in many school districts there is considerable freedom for administrators to assign teachers to help supervise students outside of the classroom, but in other districts teachers cannot be utilized for these types of duties at all or without extra compensation due to union agreements. Additionally, a variety of other local realities and conditions, building designs, facility infrastructure, the level of support from local courts, safety and security staffing, existing security and communication systems, and the prevalence of e-cigarette use by students are just a few examples of the many factors that can affect which specific school safety technologies and other measures are logical and effective choices for a particular school district and in some cases, for a specific school.

While there are certain fairly standardized types of practices, technologies, and other components for student e-cigarette prevention and intervention that I find are necessary for SFUSD to effectively meet the challenges related to what the U.S. Surgeon General has proclaimed to be a public health epidemic, these approaches must be tailored to fit the local conditions to be practical, effective, and sustainable. I also find that SFUSD will need to utilize a multi-component measurement and fidelity testing approach to continually evaluate, measure progress, validate the effectiveness of the strategy, and test for alignment between stated and actual practices. My opinions include multiple methods for SFUSD to objectively and accurately measure and test using the additional personnel and technologies that I find are necessary for the District.

Based on my experience, the comprehensive and multi-disciplinary strategy tailored to fit SFUSD that I describe in this report will ultimately make it highly unlikely that secondary school students in SFUSD will be able to use e-cigarettes on school property repeatedly without detection. As described more specifically in this report, my experience has been that thoughtful and systematic student supervision is one of the most effective ways to deter, prevent, and intervene in a variety of student conduct violations, including but not limited to sexual assaults, fights, truancy, vandalism, as well as use of alcohol, street drugs, combustible cigarettes, and e-cigarettes. Current advancements in school safety technologies—such as smart cameras, analytic software, robust and easy to use electronic hall-pass (e-

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hall-pass) systems, access control systems for difficult to supervise spaces, and a comprehensive deployment of vape sensors—can be used to augment live student supervision and would be effective measures to prevent and intervene in student e-cigarette use.

Implementation of the comprehensive and multi-disciplinary strategy tailored for the conditions at SFUSD as detailed in my opinions will, in my experience, more likely than not significantly and effectively deter student e-cigarette use at school and will enable school officials to detect and identify those students who are not deterred because of their addiction to nicotine so they can be provided with effective support and treatment as recommended by appropriate experts.

4. Factual Background Regarding Student E-cigarette Use

Electronic cigarettes, or e-cigarettes, are known by many names, such as "e-cigs," "e-hookahs," "mods," "vape pens," "vapes," "tank systems," and "electronic nicotine delivery systems (ENDS)."[1] Many of these e-cigarettes look like a USB flash drive, and one of the most commonly sold USB flash drive shaped e-cigarettes in the U.S. is JUUL, which had gained the greatest market share of any e-cigarette product in the U.S. by the end of 2017.[2] According to an article by Wang et al. published in the Journal of the American Medical Association, JUUL was still the most commonly reported usual brand of e-cigarettes among school-aged youth in 2020.[3] As a typical JUUL cartridge, or "pod," contains an amount of nicotine equal to a pack of 20 regular cigarettes, the use of e-cigarettes is not a safe activity for school-aged children and youth.

> *The potential adverse health effects for youth who inhale e-cigarette aerosol include those on the body from acute administration of nicotine, flavorants, chemicals, other particulates, and additional effects, such as (1) nicotine addiction; (2) developmental effects on the brain from nicotine exposure, which may have implications for cognition, attention, and mood; (3) e-cigarette influence initiating or supporting the use of conventional cigarettes and dual use of conventional cigarettes and e-cigarettes; (4) e-cigarette influence on subsequent illicit drug use; (5) e-cigarette effects on psychosocial health, particularly among youth with one or more comorbid mental health disorders; and (6) battery explosion and accidental overdose of nicotine.[4]*

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[1] Centers for Disease Control and Prevention, "About Electronic Cigarettes (E-Cigarettes)," https://www.cdc.gov/tobacco/basic_information/e-cigarettes/about-e-cigarettes.html#more-information.

[2] U.S. Department of Health and Human Services [HHS], "Surgeon General's Advisory on E-Cigarette Use Among Youth," Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2018, https://www.cdc.gov/tobacco/basic_information/e-cigarettes/surgeon-general-advisory/index.html.

[3] Teresa W. Wang et al., "Characteristics of e-cigarette use behaviors among US youth, 2020," *JAMA Network Open*, 4(6), 2021, DOI: 10.1001/jamanetworkopen.2021.11336.

[4] U.S. Department of Health and Human Services, Office of the Surgeon General, "E-Cigarette Use Among Youth and Young Adults: A Report of the Surgeon General," (Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion,

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According to the CDC, as of January 2020, the organization had received reports of 2,668 hospitalized e-cigarette, or vaping, product use-associated lung injury (EVALI) cases including some resulting in deaths. The CDC has received reports of hospitalization for these types of injuries from all 50 states and two U.S. territories.[5] The use of e-cigarette products has impacted not only the health of youth, but also the safe and healthy learning environment at many schools. It is widely reported that the epidemic that began with JUUL has grown to include vape devices more generally.[6] There have also been numerous reports showing that the problem of students using JUUL in schools.[7] Notably, students report being bullied into using e-cigarettes in school.[8] There are reports that children as young as first grade have found vaping devices on their school bus.[9]

Office on Smoking and Health, 2016), 100, https://www.cdc.gov/tobacco/data_statistics/sgr/e-cigarettes/pdfs/2016_sgr_entire_report_508.pdf.

[5] Center for Disease Control, "Outbreak of Lung Injury Associated with the Use of E-Cigarette, or Vaping, Products," 2020, https://www.cdc.gov/tobacco/basic_information/e-cigarettes/severe-lung-disease.html.

[6] *5 Hospitalized After Vaping Device Found in Indiana School,* ABC (Feb. 20, 2020), https://abcnews.go.com/US/hospitalized-vaping-device-found-wisconsin-school/story?id=69067857; *Two Chilliwack High School Students Hospitalized After Vaping and 'Foaming at the Mouth,'* SURREY NOW-LEADER (March 9, 2020), https://www.surreynowleader.com/news/two-chilliwack-high-school-students-hospitalized-after-vaping-and-foaming-at-the-mouth/; *Sheriff: Student Hospitalized After 'Vaping Overdose,'* WOWK-TV (Nov. 11, 2015), https://www.wowktv.com/news/kentucky/sheriff-student-hospitalized-after-vaping-overdose/; *High School Student Suffers Possible 'Vaping Overdose': HFD,* ABC 13 (Nov. 22, 2019); https://abc13.com/vaping-overdose-ted-oberg-lamar-high-school-student-suffers-possible/5711863/; *Four Edison Students Hospitalized After Vaping Incident,* WTOV 9 FOX (March 4, 2019), https://wtov9.com/news/local/four-edison-students-hospitalized-after-vaping-incident; *Student Hospitalized After Vaping in Class,* WSB-TV (Oct. 30, 2018), https://www.wsbtv.com/news/local/north-fulton-county/vaping-left-student-unconscious-at-school-prompting-police-warning-to-parents/862862134; *Lapeer Middle School Students Hospitalized After Vape Pen Exposure,* FOX 2 (Feb. 27, 2019), https://www.fox2detroit.com/news/lapeer-middle-school-students-hospitalized-after-vape-pen-exposure; *High School Student Hospitalized After Vaping,* GMA (Sept. 10, 2019), https://www.goodmorningamerica.com/news/video/high-school-student-hospitalized-vaping-65505878; *High School Students Hospitalized After Vaping Incident,* WHDH (April 4, 2019), https://whdh.com/news/high-school-students-hospitalized-after-vaping-incident/; Gary Huffenberger, *East Clinton Middle School Principal Concerned About Students Vaping,* NEWS JOURNAL (April 26, 2021), https://www.wnewsj.com/news/165597/east-clinton-middle-school-principal-concerned-about-students-vaping; *Vaping Crisis Has Now Reached Texas Elementary Schools,* ABC13 (Nov. 5, 2019), https://abc13.com/vaping-at-texas-schools-illness-symptoms-lung/5671312/.

[7] Angus Chen, *Teenagers Embrace JUUL, Saying It's Discreet Enough To Vape In Class,* NPR (Dec. 4, 2017), https://www.npr.org/sections/health-shots/2017/12/04/568273801/teenagers-embrace-juul-saying-its-discreet-enough-to-vape-in-class; *4 Students Hospitalized After Vaping THC at Rochester High School,* FOX59 (Jan. 17, 2020), https://fox59.com/news/four-students-hospitalized-after-vaping-at-rochester-high-school/; *More Than a Dozen Hall County Students Taken to the Hospital This Year After Suffering Adverse Reactions to Vaping,* WDUN (May 19, 2019), https://accesswdun.com/article/2019/5/796100/more-than-a-dozen-hall-county-students-taken-to-the-hospital-this-year-after-suffering-adverse-reactions-to-vaping; *Tough Consequences for Vaping in Cullman County Schools,* WAFF48 (Aug. 9, 2021), https://www.waff.com/2021/08/09/tough-consequences-vaping-cullman-county-schools/; *Vaping Becomes Problem in Schools as Trend Grows,* WDAM7 (March 28, 2019), https://www.wdam.com/2019/03/29/vaping-becomes-problem-schools-trend-grows/.

[8] *Hospitalized Teens Say They Were Bullied into Vaping at Virginia School,* NBC Washington (Oct. 28, 2019), https://www.nbcwashington.com/news/local/hospitalized-teens-say-they-were-bullied-into-vaping-at-virginia-school/2049619/

[9] *First-Grade Student Finds Vape Device on School Bus,* KMIZ 17 (March 4, 2021), https://abc17news.com/news/national-world/2021/03/04/first-grade-student-finds-vape-device-on-school-bus/.

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School officials across the nation have reported significant negative impacts on students, disruption of classroom instruction, a severe drain on available personnel, re-allocation of limited staff development time for teachers and other school staff, a strain on existing student assistance programs, increased expenditures, medical emergencies, and other significant problems resulting from e-cigarette use by students.[10]

Some e-cigarette issues have also posed dangers to non-users. There have been reports that schools have had to be evacuated because of e-cigarette malfunctions.[11] There are reports that e-cigarette devices have exploded in student backpacks in classrooms.[12] Additionally, there are reports that students have fallen ill after ingesting nicotine e-liquid on a school bus on the way to a K-8 school.[13] There have been numerous reports where students became ill from e-cigarette use at school which apparently involved only nicotine.[14] Other similar incidents, however, involved vaping other drugs, such

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[10] Denisa R. Superville, D. R. "What the Youth Vaping Epidemic Costs Schools," *Edweek*, 2019, https://www.edweek.org/leadership/what-the-youth-vaping-epidemic-costs-schools/2019/12; Truth Initiative, "A Classroom Crisis: How the Youth Vaping Epidemic is Impacting Teachers," (Washington, DC: Truth Initiative), 2020, https://truthinitiative.org/research-resources/emerging-tobacco-products/classroom-crisis-how-youth-vaping-epidemic-impacting.

[11] *Springfield High School Evacuated After E-Cigarette Malfunctions*, 6 ABC (Oct. 13, 2015), https://6abc.com/e-cigarette-malfunction-school-evacuation-springfield-high-delaware-county/1031153/

[12] *Vape Battery Explodes in Student's Backpack*, Boston 25 News (Oct. 18, 2017), https://www.boston25news.com/news/vape-battery-explodes-in-students-backpack/626423315/; *E-Cigarette Explodes, Burns High School Student*, CNN (March 26, 2016), https://www.cnn.com/videos/us/2016/05/10/e-cigarette-explodes-in-classmates-face-pkg.waff.

[13] Benjamin Paulin, *Brockton Girls Who Drank Vaping Liquid on School Bus Recover*, NEEDHAM, MA TIMES (April 12, 2016), https://needham.wickedlocal.com/news/20160412/brockton-girls-who-drank-vaping-liquid-on-school-bus-recover

[14] *4 Students Hospitalized After Vaping THC at Rochester High School,* FOX59 (Jan. 17, 2020), https://fox59.com/news/four-students-hospitalized-after-vaping-at-rochester-high-school/; *More Than a Dozen Hall County Students Taken to the Hospital This Year After Suffering Adverse Reactions to Vaping*, WDUN (May 19, 2019), https://accesswdun.com/article/2019/5/796100/more-than-a-dozen-hall-county-students-taken-to-the-hospital-this-year-after-suffering-adverse-reactions-to-vaping; *5 Hospitalized After Vaping Device Found in Indiana School,* ABC (Feb. 20, 2020), https://abcnews.go.com/US/hospitalized-vaping-device-found-wisconsin-school/story?id=69067857; *Two Chilliwack High School Students Hospitalized After Vaping and 'Foaming at the Mouth,'* SURREY NOW-LEADER (March 9, 2020), https://www.surreynowleader.com/news/two-chilliwack-high-school-students-hospitalized-after-vaping-and-foaming-at-the-mouth/; *Sheriff: Student Hospitalized After 'Vaping Overdose,'* WOWK-TV (Nov. 11, 2015), https://www.wowktv.com/news/kentucky/sheriff-student-hospitalized-after-vaping-overdose/; *High School Student Suffers Possible 'Vaping Overdose'*: HFD, ABC 13 (Nov. 22, 2019); https://abc13.com/vaping-overdose-ted-oberg-lamar-high-school-student-suffers-possible/5711863/; *Four Edison Students Hospitalized After Vaping Incident*, WTOV 9 FOX (March 4, 2019), https://wtov9.com/news/local/four-edison-students-hospitalized-after-vaping-incident; *Student Hospitalized After Vaping in Class*, WSB-TV (Oct. 30, 2018), https://www.wsbtv.com/news/local/north-fulton-county/vaping-left-student-unconscious-at-school-prompting-police-warning-to-parents/862862134; *Lapeer Middle School Students Hospitalized After Vape Pen Exposure*, FOX 2 (Feb. 27, 2019), https://www.fox2detroit.com/news/lapeer-middle-school-students-hospitalized-after-vape-pen-exposure; *High School Student Hospitalized After Vaping*, GMA (Sept. 10, 2019), https://www.goodmorningamerica.com/news/video/high-school-student-hospitalized-vaping-65505878; *High School Students Hospitalized After Vaping Incident*, WHDH (April 4, 2019), https://whdh.com/news/high-school-students-hospitalized-after-vaping-incident/; Gary Huffenberger, *East Clinton Middle School Principal Concerned About Students Vaping*, NEWS JOURNAL (April 26, 2021), https://www.wnewsj.com/news/165597/east-clinton-middle-school-principal-concerned-about-students-vaping; *Vaping Crisis Has Now Reached Texas Elementary Schools*, ABC13 (Nov. 5, 2019), https://abc13.com/vaping-at-texas-schools-illness-symptoms-lung/5671312/.

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as THC oil.[15] There have also been incidents where school staff became ill and required medical attention after they were exposed to e-cigarettes at school.[16]

In a study published in late 2018, an analytical sample of 81,669 tweets about JUUL related posts involving 52,098 unique users were assessed. Based on their review, the author's concluded, in part, the following:

> *The present analysis identified discussion about JUUL among Twitter users in elementary, middle or high school. When we examined the subset of School tweets, we found that the most common topic was Place of Usage, suggesting JUUL use was taking place on school grounds potentially in classes, bathrooms, libraries and gyms during school hours. The JUUL vaporizer is the size and shape of a thumb drive, and its discreetness may facilitate its use in places where vaping is prohibited. These findings may be of importance to school administrators, teachers, prevention programmers and tobacco product regulators. Educators may be in need of training on how to identify JUUL in the classroom. School administrators may consider installing vaping detectors in bathrooms and classrooms to deter the use of JUUL on school grounds.[17]*

In their efforts to prevent and address the problem of e-cigarette use by students, schools around the nation have implemented various measures ranging from behavior-based prevention approaches (such as e-cigarette-related policies and educational programs for students and staff) to physical measures (such as assigning staff for increased student supervision and using technologies for monitoring vaping activities). There has been no well-established, nation-wide comprehensive set of prevention and intervention measures to address e-cigarette use among youth.

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[15] Emily Bloch, *After Just Three Months of Vaping, Jacksonville Teen Hospitalized with Holes in His Lungs*, THE FLORIDA TIMES-UNION (Sept. 13, 2019), https://www.jacksonville.com/news/20190913/after-just-three-months-of-vaping-jacksonville-teen-hospitalized-with-holes-in-his-lungs; *Hospitalized Teens Say They Were Bullied Into Vaping at Virginia School*, NBC Washington (Oct. 28, 2019), https://www.nbcwashington.com/news/local/hospitalized-teens-say-they-were-bullied-into-vaping-at-virginia-school/2049619/; *Two Montgomery Blair H.S. Students Hospitalized After Ingesting THC with 'Vaping Device.'* ABC News (March 2, 2020), https://wjla.com/news/local/two-montgomery-blair-hs-students-hospitalized-after-ingesting-thc-with-vaping-device; Jim Woods, *Two Licking Heights HS Students Hospitalized for Vaping Suspected Liquid Marijuana, Three others Treated*, CANTONREP.COM (Feb. 6, 2019), https://www.cantonrep.com/news/20190206/two-licking-heights-hs-students-hospitalized-for-vaping-suspected-liquid-marijuana-3-others-treated; *2 Westport High School Students Taken to Hospital after Vaping THC*, Boston 25 News (Sept. 20, 2019), https://www.boston25news.com/news/police-westport-high-school-student-taken-to-hospital-after-vaping-thc/988452529/; *6 New Mexico High School Students Hospitalized After Vaping Scare*, Fox News (Jan. 25, 2019), https://www.foxnews.com/health/six-new-mexico-high-school-students-hospitalized-after-vaping-scaring-report; *Student Hospitalized After Smoking THC From Vape Pen, School Says*, ABC4.com (Nov. 3, 2018), https://www.abc4.com/news/local-news/student-hospitalized-after-smoking-thc-from-vape-pen-school-says/; *Treasure Coast Students Hospitalized After Smoking Vape Pens Laced with Unknown Substance in School*, NBC Miami (Jan. 9, 2019), https://www.nbcmiami.com/news/local/treasure-coast-students-hospitalized-after-smoking-vape-pens-laced-with-unknown-substance-in-school/3648/.

[16] *5 Hospitalized After Vaping Device Found in Indiana School,* ABC News (Feb. 20, 2020), https://abcnews.go.com/US/hospitalized-vaping-device-found-wisconsin-school/story?id=69067857.

[17] Allem et al., Characterizing JUUL-related posts on Twitter, *Drug Alcohol Depend.* 2018 September 01; 190: 1-5. Soi:10.1016/j.drugalc.dep.2018.05.018.

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Some schools, such as those in SFUSD, have implemented severe measures such as removing doors to individual stalls in student restrooms, which is a location where student vaping incidents is frequently reported to occur.[18] Other measures schools have used to try to combat student e-cigarette use include locking student restrooms at certain times and assigning additional staff for restroom monitoring. While locking student restrooms during school hours may temporarily help address the issue, it also creates a number of negative impacts on the healthy and safe learning environment at schools. In fact, In the wake of the tragic active shooting incident at Marjory-Stoneman Douglas High School (MSD) in Broward County Public Schools (BCPS) in Florida on February 14, 2018, questions were raised about whether or not the practice of locking student restrooms could have been a contributing factor in the wounding and deaths of some of the victims.

> *Once Cruz began shooting, Rospierski and approximately nine students ducked into the alcove of his classroom. Joaquin Oliver and Meadow Pollack darted into the alcove of the women's restroom. Kyle Laman ran into the alcove of the men's restroom. Joaquin Oliver and Meadow Pollack then quickly exited the alcove of the locked women's restroom. Pollack ran across the hall to join Rospierski and the other students in the alcove of his classroom doors. Oliver ran to the alcove of the locked men's restroom, after apparently seeing there was limited room in the alcove of Rospierski's classroom. The door to the third-floor restrooms had been locked due to ongoing issues with students vaping in the bathroom.*
>
> *...*
>
> *At 2:25:20, Cruz entered the alcove to the men's restroom where Joaquin Oliver had hidden. Cruz raised the rifle and again shot Joaquin Oliver.*
>
> *...*
>
> *The bathrooms on the first and third floor of Building 12 were locked on the day of the shooting. Administration made the decision to lock the bathrooms to combat a "vaping" problem occurring inside the bathrooms. Students needing to use the bathroom while in Building 12 were instructed to go to the second-floor bathrooms where a campus monitor was located to monitor traffic in and out.*
>
> *...*
>
> *School administrators' decision to lock the first- and third-floor bathroom doors prevented students, including Ashley Baez, Meadow Pollack and Joaquin Oliver, from entering the bathroom as a place of safety to avoid being shot.[19]*

In their Initial Report, the MSD Public Safety Commission specified that school officials at BCPS had begun locking student restrooms on the first and third floors of Building 12 due to problems with

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[18] Taameen Mohammad, "Alabama High School Removes Bathroom Stall Doors to Stop Kids From Vaping," *Newsweek,* 2019, https://www.newsweek.com/alabama-school-bathroom-vaping-1458376.

[19] MSD Public Safety Commission, "Initial Report Submitted to the Governor, Speaker of the House of Representatives and Senate President," (Florida Department of Law Enforcement, 2019), 32-47, http://www.fdle.state.fl.us/MSDHS/CommissionReport.pdf.

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students vaping in restrooms.[20] In the wake of the shooting, questions were raised about whether or not the practice of locking these doors could have been a contributing factor in the wounding and deaths of some of the victims on the third floor. This question arose because some of the students who were shot on the third floor attempted to enter two different locked student restrooms to hide from the attacker but were unable to gain access to the restrooms because of this practice.

When the question arose, I found it to be a compelling example of how the problem of student e-cigarette use could have a significant impact on a variety of other school safety issues. Student e-cigarette use has profoundly and negatively impacted safety in many K12 schools in part because of the reallocation of campus monitors and other personnel to supervise areas where students may be vaping. I have experienced this firsthand in my work with a number of school districts, including BCPS after the attack at MSD. The impact of e-cigarette use as documented by researchers and practitioners cited above demonstrates that e-cigarette use by students is having a major, persistent, negative, and difficult to address impact on school safety in many schools across the nation.

Notably, Juul Labs, Inc. apparently recognized the growing concern surrounding the use of JUUL devices by students in schools and hired a retired superintendent, Bruce Harter, to purportedly develop a youth prevention program.[21] In March 2018, Mr. Harter acknowledged in multiple letters to school administrators the "epidemic level" and "daily problem" of e-cigarette use in schools, "If you're like me, you may not be aware of how e-cigarettes are at an epidemic level in schools today. But over the last 18 months, e-cigarettes have become a daily problem with vaping in bathrooms, the hallways, and worst-of-all in the classroom – particularly when there is a substitute teacher."[22] He further wrote that "[t]here's an abuse in our schools and communities that's spreading like wildfire – the underage use of e-cigarettes. Over the last 18 months, the problem has grown to epidemic proportions in school lavatories, hallways, even classrooms as well as community centers and other places where young people congregate."[23] Mr. Harter acknowledged in internal emails that "teenagers find JUUL irresistible."[24]

Looking for some solution to this e-cigarette epidemic in schools, Mr. Harter and others at Juul Labs, Inc. discussed "[d]eveloping technological solutions that prevent students from using the JUUL products like wireless nodes that alert school staff to use in schools, and age-verification processes that require a connection to an adult mobile phone device for the devise to function."[25] One technological solution referred to as the "beacon" could disable JUUL devices when a student brings it to a school. Mr. Harter promoted this "beacon" technology in multiple communications he had with schools.[26] And Mr. Harter told Juul Labs, Inc. that "[t]he beacon is the door opener for conversations with school staff. Without it, they're simply not interested" and that "[i]t is the single initiative that distinguishes JUUL from big tobacco."[27] Despite that, Juul Labs, Inc. decided to abandon the "beacon" technology solution: "senior

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[20] *Ibid*

[21] Deposition of Bruce Harter, 2/18/2021 pgs. 44-46.

[22] Harter Deposition Exhibit 371, JLI00385319.

[23] Harter Deposition Exhibit 373, JLI00385454.

[24] Harter Deposition Exhibit 358.

[25] Harter Deposition Exhibit DX4.

[26] Harter Deposition Exhibit 337, INREJUUL_00306314; Harter Deposition Exhibit 340, JLI00386025.

[27] Harter Deposition Exhibit 354, JLI00018453.

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management opted to take the beacon idea off the table indefinitely."[28] In addition to the "beacon" technology, Mr. Harter discussed multiple strategies to help solve the JUUL youth use problem, including helping schools install vape detectors, hiring celebrities to give anti-vaping messages, giving grants to schools, providing funds to establish community health centers and clinics, and hiring substance abuse counselors.[29]

Mr. Harter developed draft plans for "demonstration schools" that JUUL would partner with to "eliminate vaping in those schools" by deploying significant resources aimed at e-cigarette prevention and treatment for those struggling with addiction.[30] These plans included "install[ing] technology to decrease use of vaping in the school through available vape detectors;" "the JUUL beacon or the use of nicotine-smelling dogs;" working "with local schools and districts to create and implement self-sustaining community health centers and clinics, ideally to be housed on school campuses with student access before, during and after school hours, and school community (i.e., parents/guardians) access after school hours, including summers;" teacher education programs; new prevention curriculums; hiring substance abuse counselors; "adding a health center within the existing footprint of the school" among other things.[31] Mr. Harter's goal was to create "[a] comprehensive approach including prevention, intervention and enforcement activities [that] would create pathways for the schools to solve a difficult problem...."[32]

The various factors that drive the epidemic of e-cigarette use among students have posed significant challenges to the efforts to prevent and intervene in student e-cigarette use. Of particular concern is how widespread e-cigarette use results in addiction of students, which, according to the *New England Journal of Medicine*, "increases in the proportions of youth who are physically addicted to nicotine, an addiction that is very difficult to overcome once established."[33] As a result, the variety of approaches school officials have attempted have yielded mixed results.[34] While I find that SFUSD has been measured and thoughtful in its approach to prevent and address student e-cigarette use, the District has still struggled to adequately and effectively address the e-cigarette epidemic in its schools with available resources.

As a result, the number of students using e-cigarettes continued to increase. According to data from the National Youth Tobacco Survey (NYTS), which has been administered since 2011 by both the Centers for

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[28] Harter Deposition Exhibit 354, JLI00018453.

[29] Harter Deposition Exhibit 355; Harter Deposition Exhibit 364.

[30] Harter Deposition Exhibit 355.

[31] Harter Deposition Exhibit 355; Harter Deposition Exhibit 364; Deposition of Bruce Harter, 2/19/2021 pgs. 493-95.

[32] Harter Deposition Exhibit 355.

[33] Richard Miech et al., "Trends in Adolescent Vaping, 2017–2019," *The New England Journal of Medicine 381*(15), 2019: 1490-1491, 1491, DOI: 10.1056/NEJMc1910739.

[34] Mack DeGeurin, "With Teen Vaping at all Time High, Schools are Turning to 'Vape sensors' to Snuff out Secret Smokers," *Insider* (2019), https://www.insider.com/schools-are-turning-to-vape-detectors-snuff-out-bathroom-smokers-2019-9; Denisa R. Superville and Arianna Prothero, "The Student Vaping Crisis: How Schools Are Fighting Back," *Edweek* (2019), https://www.edweek.org/leadership/the-student-vaping-crisis-how-schools-are-fighting-back/2019/08; Kristen Taketa, "Bathroom Sensors Alert School Officials to Vaping Students," *The San Diego Union Tribune* (2020), https://www.sandiegouniontribune.com/news/education/story/2020-02-27/bathroom-sensors-alert-school-officials-to-vaping-students; Lisa Washington, "Some Schools Turning To Detection Devices To Help Curb Vaping," *CBS Pittsburgh* (2019), https://pittsburgh.cbslocal.com/2019/11/07/school-districts-installing-vaping-detectors.

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Disease Control and Prevention (CDC) and the Food and Drug Administration (FDA), approximately 3.05 million (20.8%) high school students (grades 9-12) and 570,000 (4.9%) middle school students (grades 6-8) were current e-cigarette users in 2018.[35] The pervasiveness and significant surge in e-cigarette use among youths prompted the U.S. Surgeon General to declare it as an epidemic at the end of 2018. However, these numbers were even higher in 2019. The NYTS results for 2019 showed 4.11 million (27.5%) high school students and 1.24 million (10.5%) middle school students reported being current e-cigarette users.[36] The survey also found that 7.04 million (46.9%) high school students and 2.35 million (19.9%) middle school students reported having ever tried e-cigarettes.

The 2020 NYTS results showed a decrease in current e-cigarette use among secondary school students in the U.S., with 3.02 million (19.6%) high school students and 550,000 (4.7%) middle school students who reported current e-cigarette use.[37] I note that while the 2021 NYTS results showed a further decrease (with 1.72 million (11.3%) high school students and 320,000 (2.8%) middle school students reporting current e-cigarette use), the CDC advised these survey results should not be used to compare with previous NYTS results. The survey was conducted during the COVID-19 pandemic when many school districts in the U.S. had to use distance and hybrid (i.e., a combination of distance and in-person) learning for significant portions of the 2020-2021 school year. In fact, many students were still opting to continue with distance learning in the 2021-2022 school year. Because the number of in-person school days was reduced significantly, the opportunities for students to use e-cigarettes at school during this time frame were also significantly reduced. The authors also noted that many of the students responded to the survey in a location other than school, unlike the prior NYTS surveys that were conducted entirely at school. The 2021 results showed a drastic difference in reported e-cigarette use between those students who answered the survey at school versus somewhere outside of school, resulting in "potential underreporting of tobacco use behaviors or other unmeasured characteristics among youths participating [in the survey] outside of the classroom."[38]

In fact, according to a study by Kreslake et al., there was a significant decline in e-cigarette use among youth and young adult e-cigarette users during the COVID-19 stay-at-home directives (March 14-June 29, 2020) compared to the pre-COVID-19 period (January 1-March 13, 2020).[39] The study found that the stay-at-home directives presented barriers to e-cigarette access by students, and this was associated with a decline in e-cigarette use among youths and other young people. This study indicates that the number of e-cigarette users among secondary students in the U.S. during the 2020-2021 school year

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[35] Karen A. Cullen et al., "*Notes from the Field*: Use of Electronic Cigarettes and Any Tobacco Product Among Middle and High School Students — United States, 2011–2018," *Morbidity and Mortality Weekly Report 67*(16), 2018: 1276-1277, https://www.cdc.gov/mmwr/volumes/67/wr/mm6745a5.htm.

[36] Teresa W. Wang et al., "Tobacco product use and associated factors among middle and high school students – United States, 2019," *Morbidity and Mortality Weekly Report Surveillance Summary*, 68(12), 2019: 1-22, DOI: http://dx.doi.org/10.15585/mmwr.ss6812a1.

[37] Teresa W. Wang et al., "E-cigarette Use Among Middle and High School Students — National Youth Tobacco Survey, United States, 2021," *Morbidity and Mortality Weekly Report 70*(39), 2021: 1387-1389, 1389, DOI: http://dx.doi.org/10.15585/mmwr.mm7039a4.

[38] Eunice Park-Lee et al., "*Notes from the Field*: E-Cigarette Use Among Middle and High School Students — United States, 2011–2018," *Morbidity and Mortality Weekly Report 67*(16), 2018: 1276-1277.

[39] Jennifer M. Kreslake et al., "E-cigarette Use Among Youths and Young Adults During the COVID-19 Pandemic: United States, 2020," *American Journal of Public Health 111*(6), 2021, https://doi.org/10.2105/AJPH.2021.306210.

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may be significantly lower than it would have been due to significant barriers to e-cigarette access caused by COVID-19 stay-at-home directives. Despite this, recent studies have found that e-cigarette use continues to remain a pervasive problem among school-aged youth, and JUUL has and continues to play a significant part in youth use.[40]

5. Factual Background Regarding San Francisco Unified School District

Established in 1851, SFUSD serves the City and County of San Francisco as the only public school district in the City.[41] Governed by a Board of Education ("Board") comprised of seven members elected at large and a Superintendent appointed by the Board, SFUSD serves approximately 52,000 students in 107 schools.[42] SFUSD student demographics are particularly diverse. Roughly 51% of SFUSD student population is socioeconomically disadvantaged.[43] The largest three ethnic groups are Asian (33%), Latino (28%), and White (15%).[44]

Located in the City of San Francisco, SFUSD is an urban school district, with many of its school buildings situated adjacent to or amongst neighborhoods or commercial properties. And SFUSD campuses are "open" campuses. This setting provides unique challenges to SFUSD staff in providing for the safety and well-being of SFUSD students through appropriate supervision, including maintaining healthy and safe interactions between SFUSD students and SFUSD campus' neighbors.

For years, SFUSD has partnered and collaborated with local organizations on the issue of student substance abuse education, prevention, and support. In particular, SFUSD has collaborated with the University of California San Francisco. That collaboration has provided SFUSD with resources and a working knowledgebase concerning youth use of harmful substances, education and support, including information related to emerging trends. With specific regard to student use of tobacco, SFUSD has also relied on Stanford University's Tobacco Toolkit for education and support resources.[45]

For many years, SFUSD has approached the issue of student use of harmful substances through the lens of an emphasis on comprehensive health education and restorative practices. With a "'no use' goal in substance use education," SFUSD has historically applied a multifaceted approach to educating and equipping youth to make healthy decisions regarding substances:[46]

> *In all grades, classroom lessons on alcohol, tobacco, and other drugs focus on character and skill building. As students grow older, we provide opportunities for more in-depth exploration of the physiological, mental, legal, and social*

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[40] Shivani M. Gaiha et al., "E-cigarette devices, brands, and flavors attract youth: Informing FDA's policies and priorities to close critical gaps," *Addictive Behaviors*, 126, 2022, DOI: https://doi.org/10.1016/j.addbeh.2021.107179.

[41] https://www.sfusd.edu/about-sfusd; https://en.wikipedia.org/wiki/San_Francisco_Unified_School_District.

[42] SFUSD Amended Plaintiff Fact Sheet ("PFS").

[43] https://www.sfusd.edu/about-sfusd/facts-about-sfusd-glance.

[44] https://www.sfusd.edu/about-sfusd/facts-about-sfusd-glance.

[45] https://med.stanford.edu/tobaccopreventiontoolkit.html.

[46] SFUSD_001325; SFUSD_001539.

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> *ramifications of substance use and dependency. Our lessons give students time to explore their ideas regarding substance use, and we encourage them to discuss values with their families and community members. We aim to provide safe spaces for young people to practice critical thinking, and to practice communications skills that can reflect their decisions. Our school wellness programs also provide education on these topics, as well as counseling for students seeking to curtail their substance use.*[47]

SFUSD is a tobacco-free school district. Board Policy 5140.2 states:

> *San Francisco Unified School District prohibits the use of products containing tobacco and/or nicotine, including, but not limited to, smokeless tobacco, snuff, chew, clove cigarettes, and electronic nicotine delivery systems, such as electronic cigarettes, any time, in charter school or school district-owned or leased buildings, on school or district property, and in school district vehicles. …*
> *To this end, the District shall implement a comprehensive substance use prevention program that includes policies about instruction, identification, referral, intervention, cessation programs, recovering student and staff support, and enforcement/ discipline.*[48]

The policy goes on to lay out, at a high-level, the District's multifaceted approach, including "Instruction/Prevention," "Intervention," "Nonpunitive Self-Referral and Self-Disclosure," and "Recovering Student Support."[49] The policy states that substance instruction "shall focus on reducing factors that have been shown to put students at risk for substance use," "enhancing protective factors," providing "information about physiological and psychological[] effects of substance use," skill building to help students resist tobacco, training staff on substance use prevention curriculum.[50] The policy also highlights the role of parent education, community awareness, and peer education.[51]

As to Intervention, the policy states that the Board "supports intervention programs that include involvement of students, peers, school district staff, parents/guardians and siblings, caretakers, and community agencies. School district personnel shall be trained to recognize and identify behavioral indicators of substance use."[52] Relatedly, the policy also notes that the Board "strongly encourages" self-reporting of substance us by students.[53] Notably, "[a] student who self-refers or self discloses shall have a clear record from that point. Any existing referrals relative to the initiation of intervention and recovery programs shall be removed from student files at their request."[54]

The Board policy also recognizes the role and necessity of recovery programs for students addicted to harmful substances and states that the Board will support recovery programs, including alternatives to

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[47] SFUSD_001539.
[48] SFUSD_001325.
[49] SFUSD_001325.
[50] SFUSD_001325.
[51] SFUSD_001325.
[52] SFUSD_001325.
[53] SFUSD_001325.
[54] SFUSD_001325.

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the use of harmful substances and support services.[55] Finally, as to discipline, Board policy notes the importance of eliminating "vapor emitting electronic devices" and other prohibited substances and paraphernalia on school grounds "or in any situation where there school is responsible for the conduct and safety of students."[56] But SFUSD policy emphasizes the role of "interventions" over what may be referred to as punitive measures in reaching that goal.

SFUSD "has adopted restorative practices and a school-wide positive behavior intervention and support approach with the goal of creating positive school cultures, focusing on alternatives to suspension."[57] SFUSD's Student Handbook states: "The District is committed to supporting students through behavior interventions and alternatives to dismissal, suspension or other sanctions that require removal from the educational setting."[58] The Handbook and related policies address several ways in which these goals are achieved, including tiered matrices that "provide evidence-based supports and interventions that can be used to address unwanted student behaviors in a productive and educational manner."[59] The "Primary Matrix" addresses instances of drugs, alcohol, or tobacco use by students and further demonstrates the District's commitment to restorative practices and support.[60]

A primary tool for supporting students facing tobacco and nicotine challenges is the District's Brief Intervention Services Counseling ("BIS") program. As stated in the Handbook:

> *Brief Intervention is a tobacco and substance-use counseling intervention delivered by community health outreach workers, school counselors, school district nurses, deans or school social workers. This intervention consists of 2-3 one-on-one sessions that focus on why students are using drugs or alcohol. It supports students to set goals and make better informed choices relating to their drug or alcohol use.*[61]

SFUSD "generally endeavors to document violations of its prohibited substances policies," including Board Policy 5140.2 and related policy 5144.1, "most often as entry in an electronic database to track referrals for discipline or substance abuse interventions."[62] The District also relies on the Center for Disease Control and Prevention's ("CDC") Youth Risk Behavior Survey ("YRBS") when assessing trends in risky behaviors by students, including the use of vapor products. The CDC provides school-district level survey results for SFUSD—which is not the case for all school districts. The California Healthy Kids Survey and the California Student Tobacco Survey also report on student substance use in SFUSD and statewide, respectively. Of these 3rd party student surveys, SFUSD relies primarily on the YRBS when evaluating trends in substance use by SFUSD students.

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[55] SFUSD_001325.

[56] SFUSD_001325; SFUSD_001262; SFUSD_001269.

[57] Plaintiff SFUSD's Second Supplemental Responses and Objections to Defendant Juul Labs, Inc.'s First Set of Interrogatories ("SFUSD 2d Supp. Responses"), No. 7.

[58] SFUSD_001008.

[59] SFUSD_001008; SFUSD_001540.

[60] SFUSD_001008.

[61] SFUSD_001008.

[62] SFUSD 2d Supp. Rog Responses, No. 7; SFUSD_191567; SFUSD_204431; SFUSD_210127.

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Like schools across the country, SFUSD had succeeded in reducing the use of combustible cigarettes among its students. According to the District's High School Health surveys and Middle School Health surveys, the ten-year trend on students smoking combustible cigarettes has decreased significantly, as shown in the charts below.[63] Those achievements came with years of sustained effort in multiple areas, including student and parent education, community involvement, media literacy, and extensive support programs development.

High School:

SFUSD HS: Trends Over the Past 10 Years

	2009	2011	2013	2015	2017	2019	10-Year Trend
% Who smoked cigarettes on at least 1 day during the 30 days before the survey							
SF HS	10.4	10.7	7.5	5.4	4.7	6.5	Decreased ↘

Middle School:

SFUSD MS: Trends Over the Past 10 Years

	2009	2011	2013	2015	2017	2019	10-Year Trend
% Who smoked cigarettes on at least 1 day during the 30 days before the survey							Decreased ↘
SF MS	4.7	3.4	2.1	1.8	0.7	1.0	
% Who ever tried cigarette smoking							Decreased ↘
SF MS	15.7	13.8	8.4	8.7	6.9	4.8	

Although likely around in some form or fashion previously, e-cigarettes first appear to have gained attention as an unhealthy trend among SFUSD students around 2013. However, indications are that although it was a trend worth noticing and addressing appropriately, e-cigarette or vapor product usage in 2013 and the next few years was low compared to more recent years. Ms. Quarry Pak, a near-20-year veteran of SFUSD who is highly experienced in health education, particularly in the area of tobacco prevention and support,[64] testified that for 2014 and 2015, SFUSD had "little to none" and "very few" student discipline incidents relating to e-cigarettes.[65] Beginning in the 2017-2018 school year, requests started pouring in to the SFUSD Central Office from principals, nurses, and social workers for "[i]nformation about training, education, policies, what they should do with the [e-cigarette] products,

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[63] SFUSD_000182; SFUSD_000202.
[64] Deposition of Quarry Pak, 4/8/2021, Exhibit 2.
[65] Deposition of Quarry Pak, 10/7/2021, pgs. 125-26.

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because they didn't know what to do with it."[66] In fact, according to YRBS surveys for SFUSD, the percentage of SFUSD students that reported being current- or ever-users of e-cigarettes grew significantly from 2017 to 2019, the time in which JUUL product sales grew exponentially.[67]

	Percentage of students who reported as being current users of e-cigarettes		Percentage of students who reported as being ever-users of e-cigarettes	
	2017	*2019*	*2017*	*2019*
Middle School	2%	3.7%	6.9%	8.8%
High School	7.1%	16%	25%	31.1%
Table 1: *Percentage of SFUSD secondary school students who reported as being current- and ever-users of e-cigarettes in 2017 and 2019.*				

While the data for middle school students is highly concerning, the fact that high school student usage more than doubled in 2019 is alarming. According to SFUSD's interrogatory responses, SFUSD high school enrollment for the 2018-19 school year was 21,212.[68] Although no survey requiring self-reporting by youth paints the whole picture, it is reasonable to assume for the sake of illustration that the YRBS results are illustrative of the SFUSD student population. As a result, the YRBS results would more likely than not indicate that 3,394 SFUSD high school students were current e-cigarette users in 2018-19 and 6,596 had ever tried an e-cigarette or vapor product.[69] Similarly, based on SFUSD's reported middle school enrollment for the 2018-19 school year of 12,241, the YRBS results would more likely than not indicate roughly 452 SFUSD middle school students were current e-cigarette users and 1,077 had tried an e-cigarette.[70]

Results from the California Healthy Kids Survey ("CHKS") show similar trends for current e-cigarette use for 7th, 9th, and 11th grade students in SFUSD from 2016 through 2019 or 2020 (depending on the most recently available data).[71]

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[66] Deposition of Quarry Pak, 5/27/2021, pgs. 18-19.
[67] SFUSD_000142; SFUSD_000162; SFUSD_000182; SFUSD_000202;
[68] SFUSD 2d Supp. Rog Responses, No. 2.
[69] SFUSD 2d Supp. Rog Responses, No. 2.
[70] SFUSD 2d Supp. Rog Responses, No. 2.
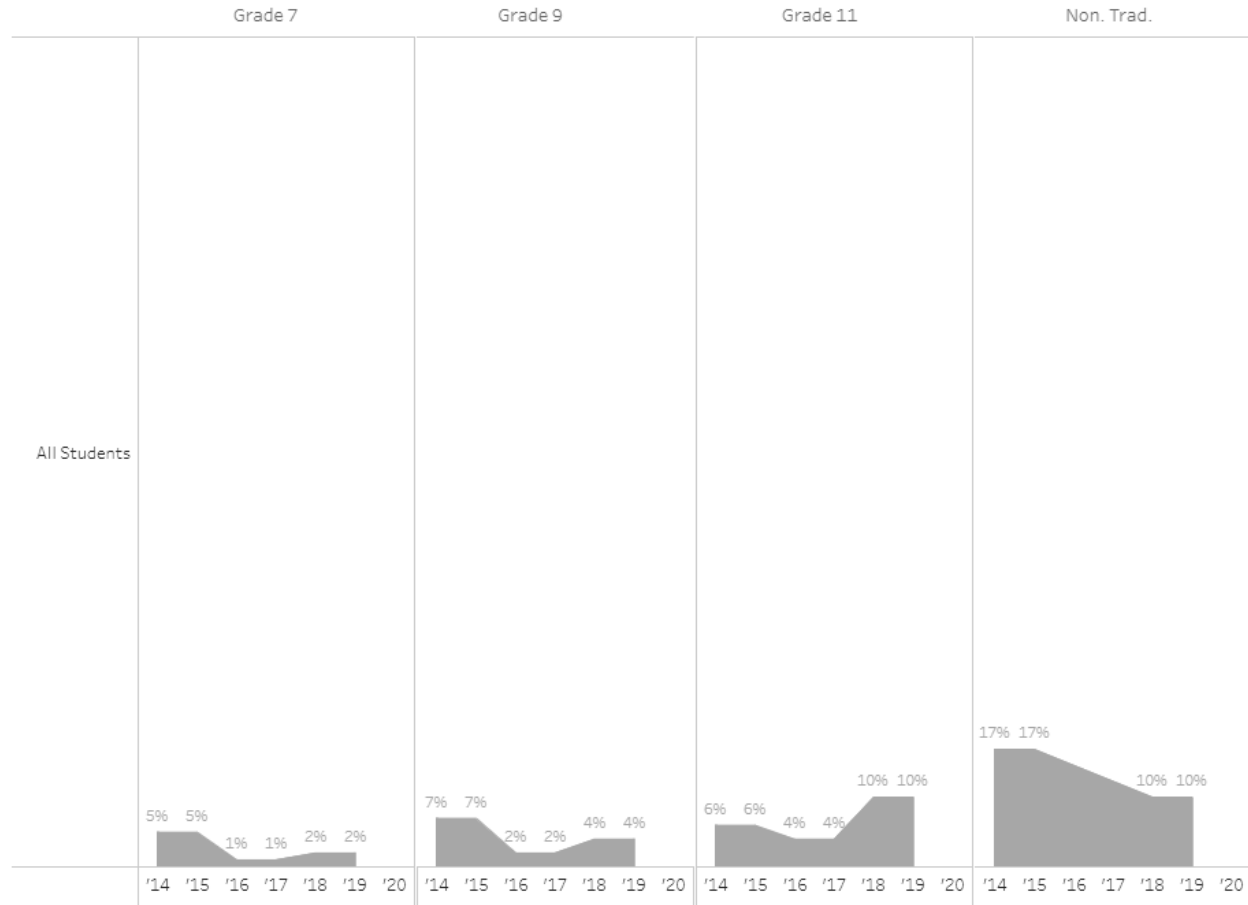[71] https://calschls.org/reports-data/public-dashboards/secondary-student/.

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County: San Francisco | Trends Over Time

Current electronic cigarette use | One or more days in the past 30 days
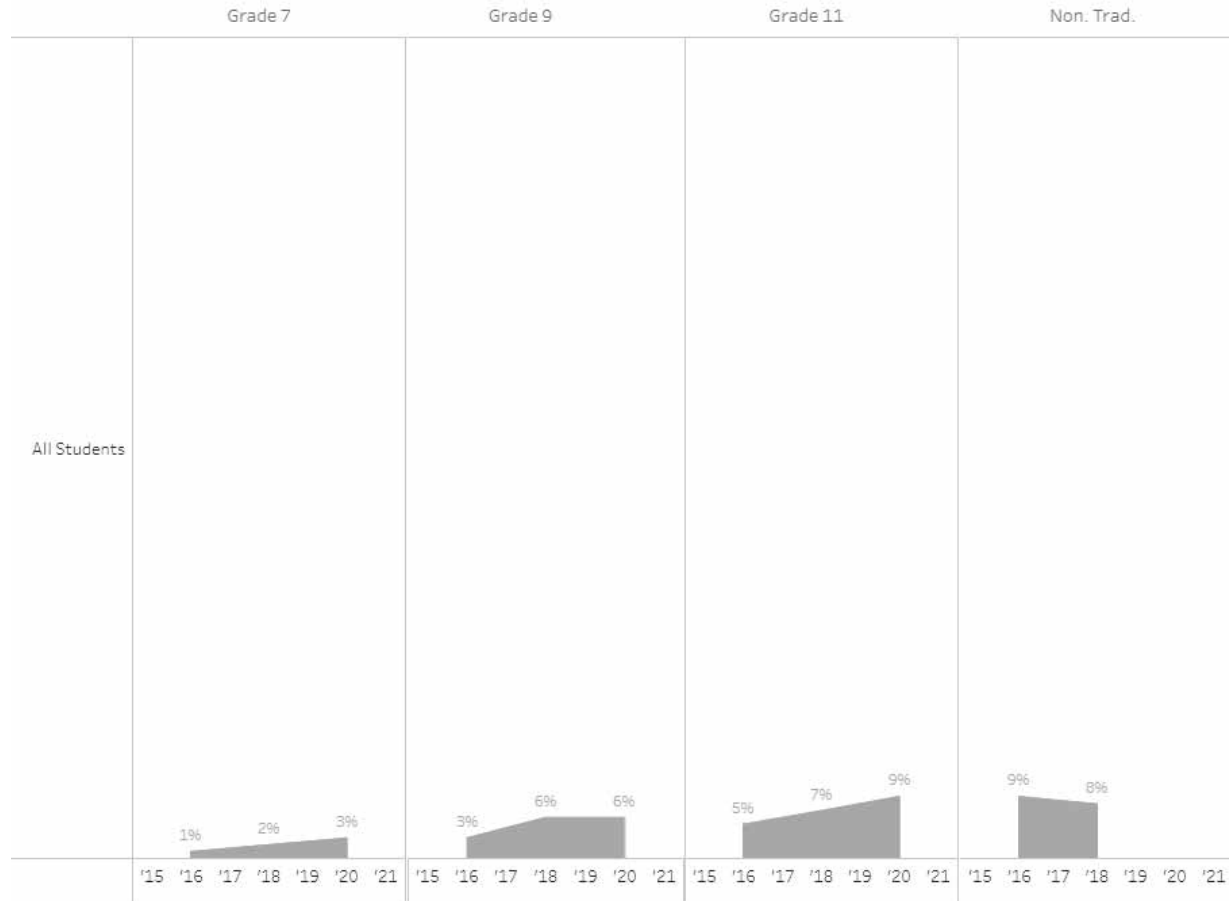
Results based on: **All Students**

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San Francisco Unified (County: San Francisco) | Trends Over Time

Current vaping |

Results based on: All Students

	Grade 7	Grade 9	Grade 11	Non. Trad.

All Students

Grade 7: '15 '16 '17 '18 '19 '20 '21 — 1% 2% 3%
Grade 9: '15 '16 '17 '18 '19 '20 '21 — 3% 6% 6%
Grade 11: '15 '16 '17 '18 '19 '20 '21 — 5% 7% 9%
Non. Trad.: '15 '16 '17 '18 '19 '20 '21 — 9% 8%

These survey results help illustrate the severity of the e-cigarette epidemic plaguing SFUSD, but it does not tell the whole story. As with any survey requiring students to self-report behaviors that violate school policy and/or the law, the results may understate the true prevalence of the behaviors. Experience and accounts from SFUSD administrators and staff who deal with the issues day-to-day are also important in assessing the scope and impact of the problem of student e-cigarette use in SFUSD schools.

As Ms. Pak testified, "[w]e know from our surveys and our student conversations that more students are using e-cigarettes and the number is increasing."[72] She also stated that SFUSD has "an epidemic of ENDS use in its schools currently."[73] According to Ms. Kimberly Coates, SFUSD Executive Director of Student, Family, and Community Support, reports of increased e-cigarette use among SFUSD students have come from students, teachers, nurses, and social workers across the District.[74] Students have self-reported as addicted to nicotine and that they cannot stop using e-cigarettes and want to know more about how

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[72] Deposition of Quarry Pak, 10/7/2021, pg. 182.
[73] Deposition of Quarry Pak, 10/15/2021, pgs. 273-75.
[74] Deposition of Quarry Pak, 10/7/2021, pgs. 34-35; Deposition of Kimberly Coates, 9/8/2021, pgs. 37, 49.

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they can stop.[75] Ms. Coates testified that "we were hearing more and more from school sites and data was showing that students were using e-cigs and Juuling."[76]

In the context of professional development, i.e., training teachers and staff, SFUSD Program Director Erica Lingrell testified that "vaping has been a huge problem, so we've been focusing our professional development on that."[77] Similarly, Ms. Coates testified that although the District has a number of health concerns for its students, "Juuling or use of E-cigarettes is right at the top."[78] Ms. Coates noted that some of the reasons that e-cigarette use is a top priority are because "it is happening in the course of the school day and in classrooms. Unlike some of the other problems that may not be happening in the midst of a classroom, we can have students with Juul devices in school, while they are in the classroom, while they're in the hallway, while they're in the bathroom."[79]

When asked about a 2019 email discussing the "growing problem" of vaping and the difficulties SFUSD faces in patrolling popular areas of student e-cigarette use, including during a particular incident involving students vaping openly, Ms. Pak testified that the occurrence was "very … emblematic – it's very illustrative of instances that have happened at other schools."[80] In its interrogatory response regarding the public nuisance in its schools, SFUSD stated:

> *Plaintiff's staff have observed student e cigarette use throughout school property, such as bathrooms, hallways, stairwells, classrooms, and outdoor areas. At least one high school began locking bathrooms during class time to make sure all students feel safe. Security personnel were needed to unlock the bathrooms when they were needed during class time.*[81]

Furthermore, the evidence indicates that JUUL products have been the most popular e-cigarette or vapor product among SFUSD students. Ms. Pak testified that JUUL "was or is the predominantly known product and most widely used."[82] JUUL was "the most popular product" and the "most familiar product to our students and staff."[83] Because of that, SFUSD professional development focused on JUUL, including a session titled "Juul School" conducted in Fall 2018.[84]

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[75] Deposition of Quarry Pak, 10/7/2021, pgs. 77, 80.
[76] Deposition of Kimberly Coates, 9/8/2021, pgs. 33:9-13.
[77] Deposition of Erica Lingrell, 8/19/2021, pg. 36.
[78] Deposition of Kimberly Coates, 9/8/2021, pg. 33.
[79] *Ibid.,* pgs. 35-36.
[80] Deposition of Quarry Pak, 10/7/2021, pgs. 170-71.
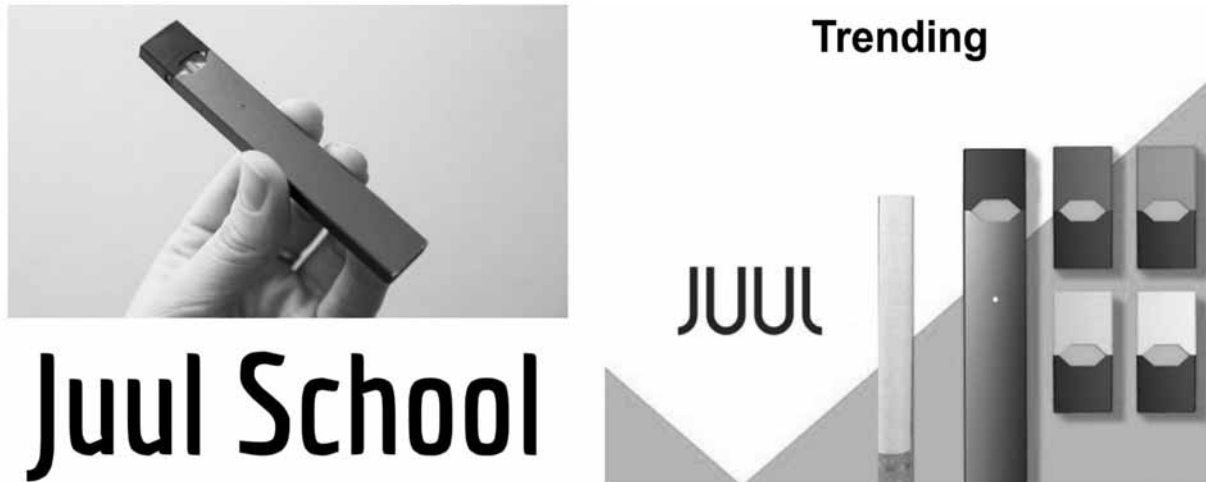[81] SFUSD 2d Supp. Rog Responses, No. 2.
[82] Deposition of Quarry Pak, 5/27/2021, pg. 23.
[83] Deposition of Quarry Pak, 10/15/2021, pgs. 309, 350.
[84] SFUSD_001936; Deposition of Quarry Pak, 10/15/2021, pgs. 309, 350; Deposition of Quarry Pak, 5/27/2021, pg. 33; Deposition of Quarry Pak, 10/7/2021, pg. 103.

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When discussing tobacco and nicotine education in the District and how it changed in response to the rise in e-cigarette use with SFUSD students, Ms. Lingrell testified that "we had to share about JUUL and let staff know what it looked like and what a problem it's becoming. ... So we put more of a focus on Juuling and vaping than had happened before."[85] When asked if she was specifically referring to JUUL products, Ms. Lingrell responded: "Yes."[86] Ms. Lingrell stated further: "Specifically, on JUUL products. We did present with other products as well but with the emphasis that Juuls was a problem and letting them [teachers] know how to recognize the JUUL technology."[87] Similarly, when asked whether she thought "JUUL products are a particular problem in SFUSD schools," Ms. Coates responded "yes," noting the attraction of JUUL products to young people, including their concealability or "covert element."[88]

Like other school districts, SFUSD was faced with the enormous task of quickly developing both professional development and student-facing education materials to address the increased use of e-cigarettes by SFUSD students. Describing the public nuisance in the District, SFUSD stated the following in its interrogatory response:

> Plaintiff has also incurred time and costs to develop curriculum, education, and training for school staff, students (including Plaintiff's Youth Outreach Workers), and parents, guardians, and caregivers. For example, vaping prevention resources for schools developed and distributed by Plaintiff's School Health Programs staff, which included information and resources for elementary through high school staff. Materials included could be used to "train staff ... and families to recognize new vaping technology, understand the risks of usage, ... [i]mplement Health Education lessons in the classroom to teach students about the risk of usage ... [and to d]evelop a schoolwide plan to connect students to [Plaintiff's] Brief Intervention Services as an alternative to suspension."

> Other vaping education resources, developed by Plaintiff's nursing staff, include "Vaping 101" for high school, middle school, and elementary school staff, used

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[85] Deposition of Erica Lingrell, 8/19/2021, pgs. 46-47.
[86] Deposition of Erica Lingrell, 8/19/2021, pg. 47.
[87] Deposition of Erica Lingrell, 8/19/2021, pg. 47.
[88] Deposition of Kimberly Coates, 9/8/2021, pg. 45.

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> *for educating those staff and teachers regarding vaping. Also, a Fall 2018 professional development training presented to Plaintiff's health educators and physical education teachers titled "JUUL School." Plaintiff's Youth Outreach Coordinators, Youth Outreach Workers, Teens Tackle Tobacco leaders, each of which are paid a stipend for their work, made presentations focused on vaping to raise awareness among students. Plaintiff also purchased tobacco cessation training for its Youth Outreach Workers. Plaintiff has also spent time developing middle school and high school lessons on e-cigarettes, including posters and visual aids. Plaintiff has incurred time and costs to offer support, intervention, and discipline to students, including Plaintiff's Brief Intervention Services, which Plaintiff previously hired a consultant to train its staff and Youth Outreach Workers on and still has a contract with the consultant for those same services. Plaintiff has incurred administrative time spent on developing new board policies and regulations to address vaping. Plaintiff has incurred time spent fielding additional media inquiries pertaining to e-cigarette use and vaping. Plaintiff has incurred time and costs for installation of anti-vaping signage in school buildings.[89]*

What SFUSD "found is that the amount of education that we had to do was more – substantively more than what we had to do previously before ENDS became available and Juul became available ... because there was no knowledge" about what the products look like and what the effects were.[90] So SFUSD personnel had to develop the knowledge themselves rather than being able to rely primarily from the types of sources it would rely on for traditional tobacco, alcohol and drug resources. "New curriculum development is a very slow process."[91] Ms. Pak testified that "it took an inordinate amount of time" to educate thousands of staff on vaping both because of the number of people needing education but also because the products were knew and nobody knew anything about them, except that nicotine was addictive.[92] When asked how much time it took, Ms. Pak stated: "Years. And we're still working on it."[93]

SFUSD was also faced with overcoming students' misperceptions regarding the health risks presented by JUUL products. As Ms. Pak testified, from surveys and the observations of teachers and staff, SFUSD is "aware that students were not aware of the harms and the risks. That [students] didn't know about nicotine in Juuls or e-cigarettes."[94] Ms. Coates also noted this "misperception" when discussing the negative impact e-cigarette use has had on SFUSD, testifying that "in feedback that has been discussed through staff, students have the misperception that [e-cigarette usage is] safe."[95] As noted in SFUSD's interrogatory response, parent education has also been a necessary part of the response. Among other

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[89] SFUSD 2d Supp. Rog Responses, No. 2; SFUSD_106217; SFUSD_115020; SFUSD_115021; SFUSD_115022; SFUSD_003477; SFUSD_014059;

[90] Deposition of Quarry Pak, 10/7/2021, pgs. 90-91.

[91] *Ibid.*, pg. 84.

[92] *Ibid.*, pgs. 94-96.

[93] *Ibid.*, pgs. 94, 84-85; Deposition of Quarry Pak, 10/15/2021, pgs. 100-01.

[94] Deposition of Quarry Pak, 10/7/2021, pg. 117.

[95] Deposition of Kimberly Coates, 9/8/2021, pg. 119.

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things, SFUSD held a "Vaping Epidemic Town Hall for Parents" at James Denman Middle School in October 2019.[96]

As discussed above, SFUSD's support for students using e-cigarettes focuses on restorative interventions and positive behavior modeling. Ms. Pak testified to the tailored approach required for each student and each circumstance and how this approach, designed to achieve the best-possible student outcome, requires significant resources to get students the help they need.[97] From SFUSD's perspective, the most effective interventions for student e-cigarette use take more time and resources (including necessary staff training) than a suspension-first approach.[98] In response to the rise in e-cigarette use by students, SFUSD has "provided increased amounts of support, interventions, and counseling sessions and – with nurses and social workers."[99] And despite "try[ing] very hard ... not to suspend," Ms. Pak testified that suspensions related to student e-cigarette use have "increased from none to substantially more," including "incidents of students selling e-cigarettes and Juuls to other students."[100]

Increased e-cigarette use by SFUSD students has caused significant disruption in the District. In its interrogatory response, SFUSD stated:

> *The increased possession and use of e-cigarettes by Plaintiff's students have caused disruptions in classrooms and common areas and require staff to take appropriate actions, diverting resources from classroom instruction and student supervision. Plaintiff's staff also take the appropriate time to provide education and assistance to students caught using nicotine, including restorative practices such as the district's Brief Intervention Services. Disruptions caused by e-cigarette incidents also negatively impact other students as staff take time to address the e-cigarette incident. Students caught violating the district's prohibited substances policies are removed from classroom instruction for some period, including out of school suspensions for certain offenses. This lost time makes it more difficult for students to appropriately progress in their education and requires additional resources to ensure continued student progression and well-being.*[101]

Ms. Lingrell, among other SFUSD district-level personnel, testified regarding the impact substance use has on the District's ability to educate students: "if students aren't learning... and not showing up for school, it impacts... our goal ... to make sure ...students show up, that they are ready to learn, that they attend school... our staff can't focus on other things. They need to focus on figuring out why the students are taking substances or how it's affecting their work, their behavior, their relationship to school."[102] Ms. Lingrell stated she had "heard several teachers complain that their students are leaving the classroom for long periods of time to go smoke Juuls in the bathroom or wherever they go; that

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[96] SFUSD_003487.

[97] Deposition of Quarry Pak, 10/7/2021, pgs. 123-24.

[98] *Ibid.*, pgs. 131-34.

[99] *Ibid.*, pg. 136.

[100] *Ibid.*, pg. 138; SFUSD_002405.

[101] SFUSD 2d Supp. Rog Responses, No. 2.

[102] Deposition of Erica Lingrell, 8/19/2021, pg. 41.

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they're losing their learning, and then the teacher has to take time away from the class to" locate the student.[103] Similarly, Ms. Coates testified that staff have expressed difficulty in "trying to stay in front of how often students are engaging in using e-cigs."[104] Teachers have "report[ed] disruption to instruction time [and] schools having to make difficult decisions about keeping bathrooms locked."[105] Continuing about the negative impact of e-cigarette use, Ms. Coates stated: "So the time and energy to address the issue [of e-cigarette use] with young people to make sure that they're getting the support that they need, the additional education that's required, all of that is -- you know, takes a lot of time and energy and is a disruption." Likewise, Ms. Lingrell testified: "this has been such a nuisance for our staff and … principals and security staff and nurses and teachers having to deal with kids going out of class to vape and … the students in the class are missing learning because the teacher has got to figure out what's happening."[106] Separate from the disruption to the learning environment and the resources necessary to provide support to students using e-cigarettes, Ms. Coates testified that the "disproportionate amount of time" staff are having to spend addressing "Juuling" makes it difficult for staff to attend to the many other needs and issues facing students.[107]

SFUSD personnel have also testified to the types of things that might help the District deal with the vaping epidemic in SFUSD. A repeated issue is time, i.e., additional staff. Ms. Lingrell testified that when asking student-facing staff what they need to improve prevention education, the answer is time.[108] "They need time in terms of just staff members," such as "having an extra security staff member, an extra nurse, an extra someone who can – who can manage all the problems that are coming up."[109] SFUSD personnel have identified a host of other needs, such as: increasing student awareness and education, increasing parent awareness, increasing community awareness, increasing staff awareness and training, additional security guards, additional prevention technology (e.g., cameras, vaping detectors), educating local retailers, installing signs in schools and nearby parks, tobacco cessation programming (particularly given the lack thereof for youth and young adults or specifically for e-cigarette use), and evidence-based prevention programming.[110] As discussed above, SFUSD prioritizes a restorative approach to student e-cigarette support. SFUSD's multi-faceted, restorative approach requires extensive resources.

6. Safe Havens' Assessment

6.1. Introduction

Safe Havens, a non-profit pre-K-12 school safety center, was retained to conduct an in-depth evaluation of student e-cigarette use at 31 secondary schools in SFUSD. According to the Centers for Disease

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[103] Deposition of Erica Lingrell, 8/19/2021, pgs. 70-71.

[104] Deposition of Kimberly Coates, 9/8/2021, pg. 110.

[105] *Ibid.*, pg. 110; SFUSD_164603.

[106] Deposition of Erica Lingrell, 8/19/2021, pg. 170.

[107] Deposition of Kimberly Coates, 9/8/2021, pgs. 151-52.

[108] Deposition of Erica Lingrell, 8/19/2021, pgs. 169-70.

[109] *Ibid.*, pg. 170.

[110] Deposition of Quarry Pak, 5/27/2021, pgs. 78-79, 133-34; Deposition of Quarry Pak, 10/15/2021, pgs. 383, 387-89, 393-96, 399, 401-402, 408-09; Deposition of Erica Lingrell, 8/19/2021, pgs. 171:10-13.

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Control and Prevention, e-cigarettes "are devices that deliver aerosolized nicotine, flavorings, and/or other chemicals into the lungs of users."[111] The use of e-cigarettes is also referred to as "vaping."

The purposes of the assessment were to:

- Identify the policies, procedures, training programs, technologies, or other resources currently in place in the District, or which had been implemented in the past, in its efforts to address the issue of student use of e-cigarettes.

- Identify the unique challenges in the District's current efforts to address student use of e-cigarettes.

- Evaluate the extent of student use of e-cigarettes at each secondary school in the District in order to determine additional deterrence and prevention measures that may be necessary in order for the school to adequately address the issue.

The information obtained in this assessment was used to help develop and deploy customized strategies and resources for each school evaluated to properly and effectively address student e-cigarette use on school grounds. As detailed in the Methodology section, evaluation of the District involved a series of on-site and off-site assessment activities, including but not limited to:

1. Review of documents regarding the policies, procedures, training programs, or other resources currently in place in the District intended to address student e-cigarette use at school.

2. Review and evaluate available data related to the prevalence of e-cigarette use among students and school-aged youth.

3. Visits to all secondary schools in the District to review and evaluate building design and security measures currently in place in each school related to student e-cigarette use at school.

4. Obtain data from school-level personnel to evaluate student e-cigarette use at school as well as the school's policies, procedures, and strategies to address the issue.

5. Obtain data from district-level personnel to evaluate student e—cigarette use and current deterrence and prevention measures at the district level.

The results of these activities for the District are set forth below.

6.2.   Methodology

The following sections describe our district-level and school-level assessment processes

6.2.1. Evaluation Tools

We developed customized assessment tools which focus specifically on prevention of student e-cigarette use and intervention in situations where students attempt to use these products. We developed these assessment tools mindful of the following issues, which are based on our experience and research in school safety, security, climate, culture, and emergency preparedness:

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[111] CDC - Tobacco Smoke in the Workplace - NIOSH Workplace Safety and Health Topic

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1. Since e-cigarettes are often discreet in appearance, and it is not easy to detect the use of these devices, students can discreetly use the products at many places in schools, even in classrooms.

2. School staff are often not aware of various types of e-cigarettes available on the market, making it difficult for them to detect or catch students using the products.

3. As with other challenging school safety problems such as bullying, gang activity, weapons possession and use, and abuse of other addictive substances, deterrence and prevention of e-cigarette use by students will be enhanced by a comprehensive approach using a variety of measures.

4. While some school systems already may have in place at least some deterrence and prevention measures related to e-cigarettes, due to their inherent limited resources and the complexity and magnitude of the problem, most will need significantly more support to properly address the issue.

As is our practice with our school safety, security, climate, culture and emergency preparedness assessments, the evaluations in this project included a combination of off-site document review, strategic-level assessments, school-level assessments, including observation of physical deterrence and prevention measures and practices currently in place at each assessed school.

6.2.2. Assessment Processes

A team of Safe Havens analysts conducted the evaluation and analysis for SFUSD in this project. The following sections describe the assessment processes used in this project.

6.2.2.1. Off-Site Document Review

We reviewed and evaluated the following documents for SFUSD:

- SFUSD Board Policy 5140.2 regarding use of tobacco, alcohol and other drugs and Policy 5144.1 regarding suspension and expulsion due process

- SFUSD student handbooks from 2012-2013 school year (SY) to 2018-2019 SY

- California Healthy Kids Survey reports for SFUSD secondary schools

- SFUSD High School Youth Risk Behavior Survey (YRBS) trend data

- Suspension data for 2013-2014 SY through 2019-2020 SY for tobacco and drug related violations for SFUSD

- *Plaintiff Fact Sheet* for SFUSD

These documents were reviewed to better understand how relatively pervasive student e-cigarettes use is at SFUSD as well as the past and current efforts by the District to attempt to address the issue.

6.2.2.2. District-Level Assessments

Guided by the strategic-level assessment tool developed by Safe Havens for this project, Safe Havens analysts conducted district-level assessments related to relevant departments in the District such as the

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Information Technology Department and Facilities Department. The purpose of these assessments was to help us better understand and evaluate the policies, practices, awareness efforts, technologies and other approaches that had been utilized at secondary schools in the District in its efforts to address the issue of student e-cigarette use at school.

6.2.2.3. On-Site Assessments

Safe Havens analysts visited each of the 31 secondary schools in SFUSD for an average of approximately four hours per school and performed the following school-level assessments:

- **Observation**: Guided by Safe Havens' customized observation tool developed for this project, the analysts evaluated various areas and issues at each school including but not limited to:
  - Difficult to supervise areas.
  - Student restroom design and practices.
  - Surveillance camera system.
  - Use of vape detection sensors.
  - Areas that may create favorable conditions for students to vape without being detected.
  - Areas students are likely to relocate vaping activities to in response to successful vaping deterrence and prevention measures.
  - Challenges in supervising students related to building design features.

- **Data from school-level personnel**: Using Safe Havens' school-level assessment tool developed for this project, Safe Havens analysts obtained data from school-level personnel including but not limited to:
  - Current student supervision practices and capabilities.
  - Measures that have been utilized to try to prevent student vaping issues on school grounds.
  - Training and awareness efforts for staff, students, and parents on related to student vaping at school.
  - Student consequences and intervention efforts to help prevent student vaping issues.
  - Barriers to effectiveness of the current measures and efforts to preventing student vaping issues at the school.

6.3. Limitations in the Scope of Assessment

The assessments in this project were limited in scope to focus on the issue of student e-cigarette use at the assessed schools. The assessment did not include:

- General school safety, security and emergency preparedness measures unrelated to vaping
- Fire code inspections

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- Building code compliance inspections

- Inspections of hazardous materials storage or chemistry lab compliance

- Formal playground inspections

- Traffic safety assessment

- Traffic assessment from an engineering standpoint

- Environmental health and OSHA compliance inspections

- Environmental safety evaluations

- Structural facility integrity or engineering inspections

- Information technology security assessments (such as firewall protection)

- Safety inspections of specific types of systems or equipment (such as boilers and electrical systems)

Other specialized types of inspection.

6.4.   Key Findings

Following are the key findings from our analysis of documents and the strategic-level and school-level assessments conducted at the 31 secondary schools in SFUSD. These findings are not listed in order of importance.

We also note that the impact of the COVID-19 pandemic had some effect on the data on e-cigarette use by students during the pandemic because the pandemic resulted in some school closures and in reduced numbers of students who participated in in-person classroom learning. During our assessment work both in this litigation and in other school safety and security assessments, school and law enforcement officials across the nation have reported to our analysts that observed and documented instances of misconduct and criminal violations by students have dropped during the pandemic. Our professional experience indicates that school closures, virtual instruction, adjustments to protect students and staff from infection (such as limiting the number of students in restrooms, student mask requirements), and the reduced number of students that have to be supervised during the pandemic are more likely than not the main drivers of the reductions reported by school districts across the nation.

We also note that due to the local and state COVID-19 protocols, SFUSD schools we assessed were open for distance learning only at the time of our site visit. Therefore, our analysts had to visit the schools when the school buildings had no students. As with other assessment projects we have conducted when enrollment was limited, we have taken differences in attendance into account in our findings.

1. **At the time of the assessment, we found that SFUSD has implemented various measures in an attempt to prevent and address student e-cigarette use at its secondary schools.**

Our review and analysis of the District's documents shows that at the time of the assessment, SFUSD has implemented various measures, in policies and practices, to address student e-cigarette use. Though not a complete list, the following are some representative examples:

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- SFUSD has a Board policy that addresses the issue of students using e-cigarettes along with other types of serious substance abuse such as alcohol, tobacco, and other drugs (policy 5140.2) as well as a Board Resolution prohibiting the sale of e-cigarettes.

- The District's documents show the District has frequently conducted surveys of students to gauge behaviors that increase health risks, including cigarette use, since 2009.

- The District has formed or participated in task forces and working groups (such as the San Francisco Free Coalition, Adolescent Health Working Group, and Tobacco Use Prevention Education Advisory Council) to address cigarette use by students since 2012.

- The District has provided the following education classes on topics related to cigarette use:

  o Middle and high school health education vaping prevention

  o Comprehensive Health Education Policy regarding cigarette use is included in middle and high school lessons

  o 20 health education lessons for elementary school students which include information on the dangers of cigarette use.

- The District has delivered Peer Health Education classroom presentations and school-wide events.

- The District has a Youth Outreach Workers program which is a peer education influence model including classroom presentations and school-wide events.

- The District has a partnership with the San Francisco Department of Public Health Community Action Model tobacco control campaign with community partners and youth leaders, including vaping and e-cigarette health curriculum translation, community clean up days for cigarette and vaping waste, and vape buy-back programs at school sites.

- The District provides students with vaping/tobacco counseling, intervention and cessation through Breathe California, 1:1 Brief Intervention Services and Referrals to cessation services, and tobacco awareness sessions.

- SFUSD middle and high school counselors, deans, and health and wellness staff have provided parents of middle and high school students with informational materials and workshops on the problem of vaping during Back-to-School Nights, Open Houses, and Parent, Teacher and Student Association meetings.

- SFUSD middle and high school teachers are trained annually on the basics and with updated known facts about vaping and how to educate students about the scientific facts regarding tobacco and e-cigarette use and how to build students' knowledge about marketing tactics of tobacco and e-cigarette industries. In my experience, many educators assume that addressing how dangerous products are marketed to students is beyond the responsibility or capabilities of a school district. I find that this proactive approach on the part of SFUSD indicates not only innovation but also a high level of commitment to address student e-cigarette use.

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- The District provides middle and high school nurses with various resources to use at their schools.

District-level and school-level personnel also identified these measures as the District's efforts to address the issue of students using e-cigarettes. Our assessments also showed that all 31 SFUSD middle and high schools use Social Emotional Learning (SEL). SEL involves approaches that help students and adults develop and apply knowledge, concepts and skill sets needed to manage emotions and make appropriate choices relating to behavioral conduct and communications with others as an alternative to suspension and expulsion. SFUSD Student and Family Handbooks since 2015 show that various behavior approaches have been used as alternatives to suspension and expulsion to address drug/alcohol/tobacco violations.

In addition, SUFSD uses various behavioral approaches such as Positive Behavior Intervention and Support (PBIS), Restorative Practices, Tiered Behavioral Discipline Matrix, Behavior Intervention Plan, Behavior Intervention Services Counseling, Behavioral Response to Intervention, etc. to address tobacco and e-cigarette violations. It appears that SFUSD has a very structured and standardized approach to address the issue of students using e-cigarettes at secondary schools. We note that as with other strategies, these behavioral approaches do have limitations. We have had consistent feedback from hundreds of public school officials in school districts we have assessed that SEL, PBIS, and other behavioral approaches have been highly effective in reducing instances of student misconduct when utilized properly and as part of a comprehensive approach. However, these approaches must be supported by other measures to address pervasive societal problems such as e-cigarette use.

The District's website also shows that SFUSD provides Tobacco Prevention Education and Intervention through a state funded grant that makes information available to all students with age-appropriate programs.[112] Specifically, SFUSD provides the following:

- HealthSmart Substance Use Lessons for elementary schools.

- For middle schools:

  o **Project Alert**: A research-validated Tobacco and Drug Prevention Education Curriculum for seventh grade students.

  o **Peer Education**: The District has trained more than 130 students as Middle School Tobacco Youth Outreach workers who provide Classroom Peer Education and lead Anti-Tobacco media and school campaigns.

  o **Intervention Services**: SFUSD provides students who are caught using cigarettes on campus with a Mandatory Tobacco Awareness session with a school district nurse, social worker, or trained Tobacco Youth Outreach worker.

- For high schools:

  o **Project Toward No Drug Abuse (TND)**: A research-validated Tobacco Prevention Education Curriculum for all high school students.

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[112] https://www.sfusd.edu/health-education/substance-abuse-education

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> o **Peer Education**: The District has trained more than 150 students as High School Tobacco Youth Outreach workers who provide Classroom Peer Education and lead Anti-Tobacco media and school campaigns.
>
> o **Intervention Services**: Students who are caught using cigarettes or vaping on campus are issued a Tobacco citation and required to take a Mandatory Tobacco Awareness session with a school nurse or trained Tobacco Youth Outreach worker.
>
> o **Quit Groups**: The District offers a Quit Group or provides one-on-one counseling with a community-based agency or school nurse for the students who are interested in cutting back or quitting cigarette use.

All of these measures are important and should be taken into consideration when developing comprehensive strategies to enable SFUSD to properly and effectively address student use of e-cigarettes at school.

2. **While SFUSD has made significant efforts to prevent and address student e-cigarette use on school property, our assessment found that due to limited resources and the pervasive negative impact and challenges e-cigarette use have had on the teaching and learning environment, the deterrence and prevention measures in the District are inadequate to properly address the problem of vaping by students.**
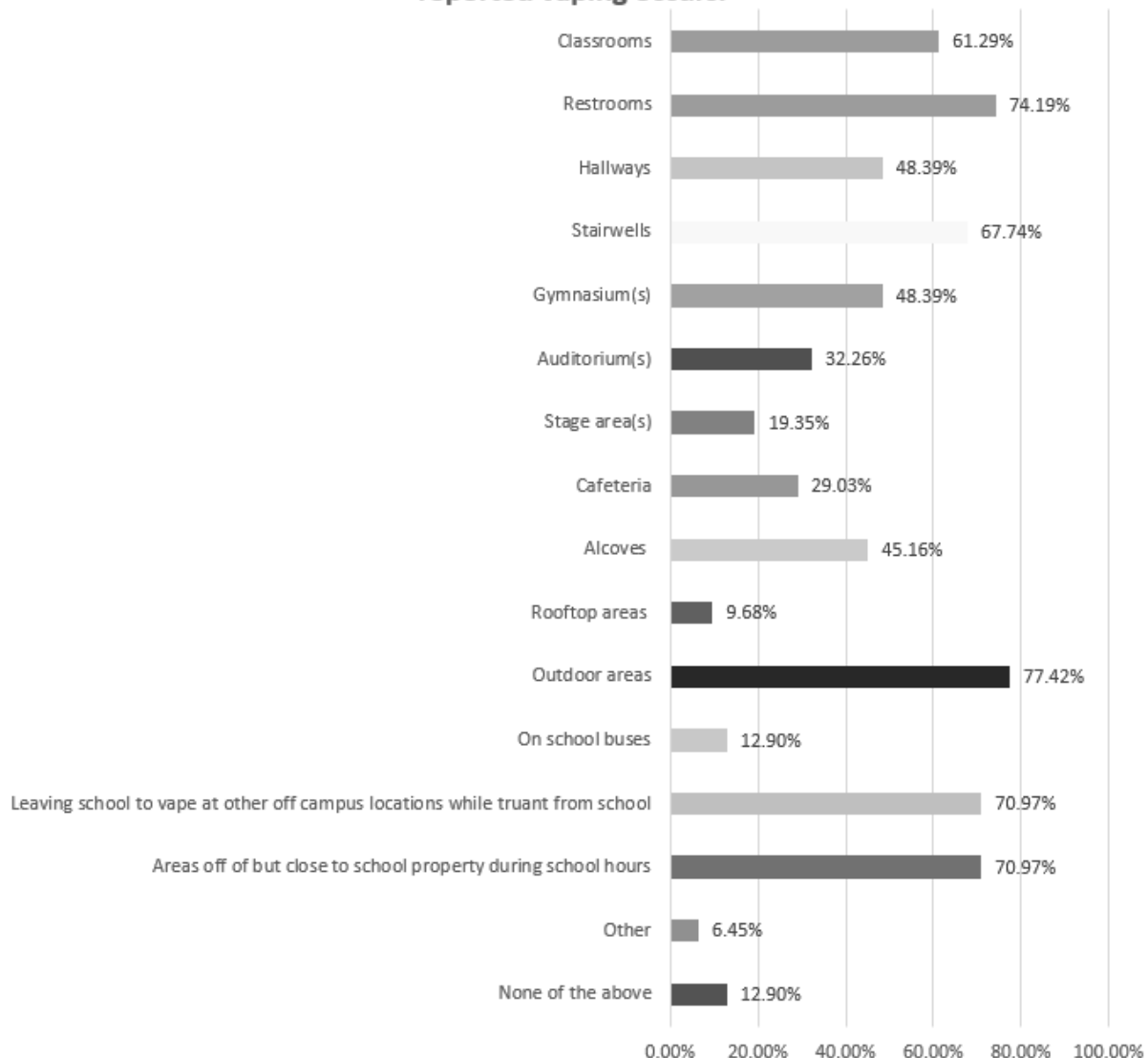
Our assessments at all 31 secondary schools in the District showed that students have used e-cigarettes in various areas inside and outside school buildings. This is summarized in the chart below:

Q: Based on incidents where students have been caught vaping, students have reported vaping occurs and/or student survey data, where have students been vaping?

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Areas where SFUSD secondary school students have been caught vaping or have reported vaping occurs.

Area	Percentage
Classrooms	61.29%
Restrooms	74.19%
Hallways	48.39%
Stairwells	67.74%
Gymnasium(s)	48.39%
Auditorium(s)	32.26%
Stage area(s)	19.35%
Cafeteria	29.03%
Alcoves	45.16%
Rooftop areas	9.68%
Outdoor areas	77.42%
On school buses	12.90%
Leaving school to vape at other off campus locations while truant from school	70.97%
Areas off of but close to school property during school hours	70.97%
Other	6.45%
None of the above	12.90%

The fact that students are often able to use e-cigarettes in various areas on school grounds without being caught combined with the scope, scale, rapid onset, and impact of vaping makes it extremely challenging for school personnel to address the issue. As discussed above, the District has expended significant resources to address the issue of students using e-cigarettes on school property. However, the District still faces extreme challenges in addressing the issue. SFUSD district-level personnel advised us that the rapid onset of students using e-cigarettes on school property and its substantial negative impact on school operations and the learning environment have created a wide array of new challenges that traditional school safety efforts, security measures, and student conduct intervention strategies are not designed for nor adequate to address.

SFUSD district-level personnel reported that one major challenge has been that the trends related to vaping have unevenly impacted various subgroups of students who, in some cases, are at increased risk, particularly at middle and high school. As an example, SFUSD student vaping rates have been higher

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among white students and among students who identify as LGBTQ (lesbian, gay, bisexual, transgender and queer or questioning). Due to the LGBTQ student population served by the District, staff expressed concerns about the large number of all-gender restrooms available for use by students. These restrooms are often lockable and because they are single occupancy restrooms, it is very difficult for staff to monitor these restrooms for e-cigarette use by students.

District-level personnel reported significant challenges with students, parents, guardians, and siblings of students still lacking awareness about the dangers of e-cigarette use. The personnel reported that students and their families are often still not aware of how much nicotine e-cigarette products contain and they often have incorrect perceptions about how addictive e-cigarettes are. The personnel reported having encountered parents and guardians of students who argued with administrators about the dangers of e-cigarettes and the potential for addiction. This dynamic creates challenges for staff to build and maintain positive and cooperative relationships between school personnel and these parents and guardians.

District- and school-level personnel reported that e-cigarette use by students was highly disruptive to the operation of their schools, interfered with educational processes, and created a significant drain on their limited resources. SFUSD personnel reported that e-cigarette use by students has resulted in significant loss of instructional time for staff and students due to the disruption caused by vaping incidents, instructional time missed due to suspensions, time and human resources required for awareness programs for staff and students, staff time required for intervention measures for vaping violations, court appearances, and other negative impacts resulting from the problems caused by students vaping.

District-level personnel reported that many students who use e-cigarettes have considerable trouble in terms of academic achievement due to increased difficulty staying focused in class and when studying. The personnel also expressed significant concerns about the short and long-term health and well-being of students who use e-cigarettes and the impact of health problems on the ability of students to succeed in school. Moreover, resources and efforts expended by SFUSD to try to prevent and address the issue have prevented the District from providing other much needed types of support for students. This has resulted in a significant negative impact on the District's ability to properly meet the needs of its students. We note that in our experience, this type of situation typically has the greatest negative impact on the students who have the most need for assistance.

SFUSD personnel also reported implementation of a number of new approaches to try to address the rapidly emerging and impactful problem of e-cigarette use by students in District schools. However, SFUSD personnel also reported that while they had been able to address this problem to some extent, these efforts have proven to be inadequate to effectively address the problem due to limited resources. In fact, as detailed later in this report, even with the significant investment in the measures and strategies that have been implemented, there are significant opportunities for improvement in the current efforts. For example, our school-level assessments revealed that only 13 of the 31 secondary schools (41.94%) in the District had a formalized approach that requires students who violate the district e-cigarette policy to participate in a training session designed to increase their level of awareness regarding the health consequences, negative impacts, and dangers that can result from e-cigarette use.

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Our assessments also reveal that only eight of the 31 schools (25.81%) had a vaping cessation program for students who violate the e-cigarette policy.

As another example, while the District's website shows that the District provides a Mandatory Tobacco Awareness session for students who are caught using tobacco on campus, our assessments showed that only 13 of the 31 secondary schools (41.94%) in the District provided mandatory vaping awareness sessions for e-cigarette use violations. Thus, either the District does not have a mandatory vaping awareness session for vaping violations (as it does for tobacco violations) or not all SFUSD school administrators were aware of the availability of mandatory vaping awareness sessions for vaping violations.

Additionally, in an effort to try to prevent students from leaving class so they could vape in unsupervised areas, nine of the 31 secondary schools (29.03%) in SFUSD implemented the practice of limiting the number of students allowed in restrooms at the same time, and 11 of the 31 schools (35.48%) limited the amount of restroom time. These approaches reduce the freedom of all students in an attempt to address the actions of some students. The implementation of these intrusive and unpopular approaches indicates that school administrators at SFUSD secondary schools have encountered significant challenges in their efforts to combat student e-cigarette use and have felt compelled to use approaches that can be harmful to school climate and culture.

In general, while SFUSD has developed and implemented various measures to address the problem of student e-cigarette use, the District's current measures focusing on behavioral approaches are inadequate to meet the many challenges posed by this problem. According to SFUSD suspension data for tobacco and drug related violations from the 2013-2014 SY through the 2019-2020 SY, incidents involving "possess/use tobacco/nicotine products" (California Education Code 48900(h)) accounted for the third highest number of suspensions for tobacco and drug related violations in the District in 2018-2019 SY and 2019-2020 SY, as shown in the table below:

Education Code	Number of Suspensions for Education Code Violations for School Year						
	2013-14	*2014-15*	*2015-16*	*2016-17*	*2017-18*	*2018-19*	*2019-20*
48900(c)-Possess/sell drugs, alcohol, intoxicant	27	39	23	37	38	29	20
48900(d)-Arrange to sell fake drugs/intoxicant	0	4	6	0	2	3	1
48900(h)-Possess/use tobacco/nicotine products	2	4	1	5	7	17	16
48900(j)-Drug paraphernalia related	11	18	7	4	4	14	9
48900(p)-Sell/offer to sell Soma	0	0	0	0	0	0	0
48915(a)(1)(C)-Possess drugs/controlled substances	49	45	25	30	48	64	54
48915(c)(3)-Selling controlled substance	12	7	3	9	14	11	11

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Education Code	Number of Suspensions for Education Code Violations for School Year						
	2013 -14	*2014- 15*	*2015- 16*	*2016- 17*	*2017- 18*	*2018- 19*	*2019- 20*
Table 2: *SFUSD Suspension Data for 2013-14 SY Through 2019-20 SY for Tobacco and Drug Related Violations.*							

The data also shows a significant increase (more than 200%) in suspensions for "possess/use tobacco/nicotine products" for 2018-2019 SY and 2019-2020 SY compared to the 2017-2018 SY at SFUSD. Since data from SFUSD student surveys showed a much higher number of middle and high school students who used e-cigarettes than those who reporting smoking, it is reasonable to assume that violations for possessing/using e-cigarettes accounted for the majority of suspensions for code "possess/use tobacco/nicotine products" violations at SFUSD during the 2018-2019 SY and 2019-2020 SY. In fact, according to the 2019 SFUSD High School Health Survey, the percentage of SFUSD high school students who currently used an e-cigarette in 2019 (16.0%) was approximately 2.5 times higher than the percentage of the students who currently smoked cigarettes (6.5%). Similarly, according to the 2019 SFUSD Middle School Health Survey, the percentage of SFUSD middle school students who currently used an e-cigarette in 2019 (3.7%) was approximately 3.7 times higher than the percentage of the students who currently smoked combustible cigarettes (1.0%).

These survey results indicate that while the current prevention and intervention measures at SFUSD seem to be having a significant impact on reducing the number of students smoking combustible cigarettes, the measures have not proven to be adequate to address the problem of student e-cigarette use. Therefore, we found that significant additional resources will be needed to properly address the problem.

3. **Our school-level assessments at the 31 secondary schools in the District showed opportunities for improvement in training programs for school staff, students, and parents regarding student e-cigarette use.**

As discussed earlier in this report, the array of e-cigarette devices and accessories make it significantly more difficult for school personnel to detect a student who possesses and uses e-cigarettes in the school setting. Our analysts have received reports of challenges with advanced methods students have used to try to conceal e-cigarette use, including but not limited to the following examples:

- Using hoodies to conceal vaping.

- Using lanyards designed to hold and conceal e-cigarettes.

- Using e-cigarettes which are manufactured to look like innocuous items like jump drives.

- Cutting ceiling tiles in student restrooms to create difficult to detect spaces where e-cigarettes can be stored when not in use to reduce the chance that the student would be caught with a device on their person.

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School personnel also often reported to our analysts that many students were very skilled at concealing both e-cigarette devices and their use of the devices at school, and based on reports from students and staff, those are the reasons why many instances of student e-cigarette use are not detected. Therefore, to properly and effectively address the issue of students using e-cigarettes, school staff should be aware of the various types of e-cigarettes currently available in the market.

However, school-level personnel at 26 of the 31 secondary schools (83.87%) in the District reported that staff at their schools lack awareness of how to recognize the various types of e-cigarettes available. This lack of awareness among SFUSD school staff indicates that improvement in staff training programs about the issue should be made. Our assessment found that only seven of the 31 secondary schools (22.58%) provided staff with awareness training on the issue. Thus, either this type of staff training is not a district-wide program at SFUSD, or not all SFUSD school administrators were aware of such training if it was available. Either way, the strategies to enable SFUSD to properly and effectively address student e-cigarette use should include the measures to ensure that all school-level personnel in the district be aware of and receive training on these issues.

Additionally, our assessments also revealed the following opportunities for improvement in the current awareness training for SFUSD school staff regarding student e-cigarettes use at the seven schools that did provide some training for employees:

No.	Interview Question	Answer Choice		
		Yes	No	N/A
1	Is the training required for all current employees?	4	3	0
2	Is the training provided during the onboarding process for new personnel?	2	3	2
3	Is the training provided to substitute teachers?	0	5	2
4	Is the training conducted in an online format?	1	5	1
5	Does the training provide information on how to recognize specific behaviors that are often associated with vaping?	1	4	2

These improvements should be incorporated in the strategies to enable the District to properly and effectively address student e-cigarette use. Our assessments also indicate opportunities for improvement in training programs for students on the issue of using e-cigarettes among youth and teenagers. According to the results of the California Healthy Kids Survey (CHKS) conducted by WestEd with 2,397 students grades 7, 9, and 11 from SFUSD secondary schools during school year 2019-2020, 27, 22, and 20% of students in grade 7, 9, and 11, respectively, responded that they do not think it will harm themselves physically or in other ways if they use vape products several times a day. These survey results indicate a significant lack of awareness of the harmful effect of vaping among SFUSD secondary students. The results of the 2019-2020 CHKS also show that 41, 52, and 43% of students in grades 7, 9, and 11, respectively, do not know if their schools have a policy that bans tobacco use and vaping on school property and at school sponsored events.

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Our school-level assessment showed that only 19 of the 31 secondary schools (61.29%) provided students with awareness training on vaping issue. This indicates that either the District does not have a standardized district-wide awareness training program on e-cigarettes for secondary students, or administrators at 12 of the 31 schools (38.71%) were simply not aware of the program. Additionally, the administrators at seven of the 19 schools (36.84%) that provide the training had concerns about the training. The most commonly expressed concern was the amount of staff time required. Other concerns include language barriers (i.e., some students do not speak English as their primary language, so they may not understand what is taught) and time limitations (i.e., the training is only provided within the health class, so there is no follow-up after the classroom instruction). These survey data and our assessment findings demonstrate that there are significant opportunities for improvement in SFUSD training programs for students on the harmful effects of e-cigarette use as well as a need for increasing the awareness of students regarding policies on tobacco use and vaping on school grounds. These improvements should be incorporated in the e-cigarette deterrence and prevention strategies for the District.

Finally, our assessments also revealed opportunities for improvement in training programs on the issue for parents. Since parents play critical roles in helping preventing youth and teenagers from using e-cigarettes, it is extremely important that parents fully understand the dangerous impacts of vaping and nicotine addiction to the healthy development of a child and buy into the programs and efforts to address the issue. However, our assessments show that only eight of the 31 secondary schools (25.80%) in the District provide parents/guardians with awareness training on student vaping. Therefore, improvements should be incorporated in the strategies for the District to properly and effectively prevent and address student e-cigarette use.

4. **Our assessments showed that while SFUSD school officials have expended considerable effort to provide improved student supervision in order to limit the ability of students to get out of classes to vape in unsupervised areas, significant improvements are necessary.**

According to our assessments, SFUSD secondary schools have used various approaches in an effort to try to prevent students from leaving class so they can vape in unsupervised areas. These approaches have included some intrusive and highly unpopular measures such as locking restrooms. For example, our assessments showed that nine of the 31 secondary schools (29.03%) in SFUSD implemented the practice of limiting the number of students allowed in restrooms at the same time, and eight of those nine schools (88.89%) chose to lock restrooms, among other measures, to enforce the practice. Another unpopular and restrictive approach found in 11 of the 31 secondary schools (35.48%) in SFUSD was the practice of limiting the amount of time students have to use the restroom in an effort to address student e-cigarette use in restrooms. We note that while these invasive and unpopular approaches have had some impact to help reduce vaping, these types of measures tend to alienate students because they result in the reduction of freedom of all students to address the actions of some students. Because positive relationships between school officials, teachers and students are very important to the overall level of safety in K12 schools, these approaches, while perceived as necessary in some circumstances, can be harmful to school climate and culture.

Our assessments also revealed other opportunities for improvement in the approaches to student supervision at SFUSD secondary schools. For example, only 24 of the 31 secondary schools (77.42%) in

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SFUSD had a written student supervision plan to guide staff on their student supervision duties. Additionally, only 21 of the 31 schools (67.74%) provided their staff with formal training on student supervision techniques, and only one of those 21 schools (4.76%) required substitute teachers to complete training on student supervision techniques. These opportunities for improvement should be incorporated in the strategies for SFUSD to properly and effectively prevent and address student e-cigarette use on school grounds.

5. **Our assessments revealed significant opportunities for improvement in the use of hall-passes to more effectively supervise students to address e-cigarette use.**

A hall-pass, which can be a paper form, an object, or an electronic system, is issued to a student to demonstrate permission from a teacher allowing a student to temporarily leave a class for a specific purpose, such as going to the restroom or visiting the nurse's office, and then returning to their class. Students sometimes need and should be approved to leave their class for those and other purposes. However, without an effective hall-pass system, it can be extremely challenging for school personnel to determine if a student who is moving about the school has permission to do so or not. As a result, students in schools without effective hall-pass systems can and do often engage in inappropriate conduct such as using e-cigarettes. Our analysts have encountered many instances where schools lacking an effective and reliable hall-pass system have experienced significant problems with student misbehavior. Many of our analysts have been personally involved in instances where students have been caught vaping in schools where opportunities for improvement in student hall-pass approaches were noted. Our analysts have encountered this as practitioners working in K12 schools and/or while conducting assessments for Safe Havens.

While many schools do work hard to implement and maintain viable hall-pass approaches to try to prevent vaping, the negative impacts and challenges resulting from students using e-cigarettes are so severe in many schools that traditional hall-pass approaches such as paper-based systems have proven inadequate. As mentioned elsewhere in this report, our research and assessment in this project documents that unlike cigarettes, the discreet and stealthy appearance as well as ease and short time frames required to use e-cigarettes make it significantly more challenging for school staff to effectively supervise students to prevent and address use. We find that using traditional measures such as paper-based hall-pass systems creates significant burdens on school personnel and are simply not robust enough to reliably prevent and intervene in student e-cigarette use. For these and other reasons, we find that more robust hall-pass systems are extremely important for schools with e-cigarette use problems.

There are a variety of hall-pass systems currently in place at many schools in the U.S. In our experience, while robust e-hall-pass systems are now available to schools with adequate fiscal resources, the majority of schools we have assessed still rely on traditional paper-based hall-pass systems. The following are some examples of traditional paper-based hall-pass systems:

*   Some schools use paper hall-passes with the student's name, reason the pass was granted, destination, time issued, and the name and/or signature of the issuing teacher. In addition, some schools also use different formatting and/or color for paper hall-passes which correspond to where the students are allowed to go in the school with the pass. For example, some schools

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use a different color or numbering system for each hallway in a school to make it easier for staff to visually detect a student who is abusing a hall-pass by going to an area in the school they have not been authorized to travel to. Many schools also commonly use a distinctive design for these types of paper passes and change the design and/or color of the passes periodically to make it more difficult for students to forge hall-passes.

- Some schools use a roster in each classroom for students who are issued hall-passes to sign out from and back in the class with the student's name, reason for leaving the class, as well as date and times of departure and return. Typically used in concert with visible hall-passes, these rosters can be reviewed by lead teachers and building administrators to identify teachers who are prone to giving passes far more often than other teachers.

- Many schools utilize an approach where each teacher has a large and visually distinctive object which is issued to and must be carried by students who have been granted permission to leave a classroom by a teacher. For example, a particular coach might use a small football while a science teacher might use a toy microscope for the visual identifiers for their students who have been granted a hall-pass. When used in combination with a written hall-pass and sign out roster, the use of these types of visual indicators can make it much easier for school employees to detect students who are out of place without authorization and can make it easier for administrators to recognize situations where particular teachers are granting an excessive number of hall-passes so corrective action can be taken by administrators.

- Though not as common, some schools use stickers that have a fadeout feature that makes the paper hall-pass visibly invalid after a given time period such as 30 minutes, one hour, etc. This type of system makes it difficult for students to reuse or forge hall-passes.

While these paper-based systems have advantages (such as being easy for teachers to issue), they inherently have many weaknesses that can limit their effectiveness. For example, the systems do not offer a way for school staff or administrators to detect if a student has been out of the class with a pass for a long time. Due to their limitations, paper-based hall-pass systems are not very effective in helping school staff limit the number of students and their time in restrooms or to prevent them from using restrooms or other areas as a location to vape. For this reason, we recommend the use of a robust e-hall-pass system that can dramatically improve the ability of school staff and administrators to prevent and address e-cigarette use by students on school property.

According to our assessments, none of the 31 secondary schools in SFUSD had an e-hall-pass system. Therefore, we recommend a robust e-hall-pass system for SFUSD secondary schools as part of the comprehensive strategy to effectively and properly prevent and address student e-cigarette use.

6. **None of the 31 secondary schools in the District have any personnel assigned to serve solely or primarily as e-cigarette use deterrence and prevention coordination personnel.**

As discussed above, the suspension data for the District from 2013 to 2020 shows "possess/use tobacco/nicotine products" (Code 48900(h)) accounted for the third highest number of suspensions for tobacco and drug related violations in the District in the 2018-19 SY and 2019-20 SY, and there was a significant increase (over 200%) in suspensions for this code violation during those two school years

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compared to the 2017-2018 SY. This data indicates that the problem of students using e-cigarettes at SFUSD secondary schools is still quite serious and needs to be addressed properly. This level of prevalence of student e-cigarette use in the District's secondary schools as well as the widespread nature and negative impacts of student e-cigarette use on the learning environment make it critical for SFUSD to have a dedicated staff member tasked specifically to oversee, coordinate, and assist the District and its schools in their efforts to effectively prevent and intervene in this pervasive problem. We find that it would be completely inadequate for SFUSD to attempt to use the current limited school safety and student services personnel to carry out the many additional tasks that will be required to effectively prevent and address student e-cigarette use.

However, our assessments at both the school and district level revealed that neither the District nor any but one of the individual secondary schools have any staff member assigned to serve solely or primarily as e-cigarette use deterrence and prevention coordination personnel. Therefore, due to the size and complexity of SFUSD as well as the pervasiveness of the problem at its secondary schools, we recommend that the District have full-time properly trained and qualified personnel tasked to coordinate and oversee the many duties which will be required to effectively prevent and address student e-cigarette use in the District's schools.

7.   **None of SFUSD secondary schools have any vape sensors.**

As discussed above, e-cigarettes are discreet in appearance and vaping does not produce the lingering cloud or the odors of cigarettes, which makes it hard to detect students vaping. However, there are various types of sensors that will detect the vapor from e-cigarettes. For example, specialized sensor devices which resemble smoke or carbon monoxide sensors can detect vaping. These types of sensors are also referred to as "vape sensors." Some vape sensors are also capable of detecting vaping of THC oil, an active ingredient in marijuana.

Most vape sensors currently available on the market will send a notification to school-level personnel (or the personnel designated to receive those notifications) when the sensors detect vaping. Though the cost of these units has been too high for many school districts to deploy, or to deploy in a sufficiently comprehensive way, increasing numbers of school districts around the United States have installed vape sensors at their secondary schools. Hundreds of schools and school districts in New Jersey, Ohio, Illinois, and Connecticut have requested funding for or have installed vape sensors in student restrooms at their middle and high schools.[113] According to SFUSD district-level personnel and school-level personnel, no school in the District has any vape sensors installed as the District has to date not had an adequate budget to purchase the number of vape sensors that would be required to help effectively address the issue of student vaping.

A significant challenge for school officials contemplating the use of vape sensors has been budget limitations. The cost of vape sensors and any associated licensing fees has typically resulted in an inadequate number of vape sensors being installed, even in the most problematic areas such as student

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[113] Leah Asmelash, "High Schools Embrace 'Vape Detectors' in Fight Against Bathroom Vaping, *CNN* (2019), https://www.cnn.com/2019/09/12/health/vaping-detectors-school-trnd/index.html; Mack DeGeurin, "With Teen Vaping at all Time High, Schools are Turing to 'Vape Detectors' to Snuff out Secret Smokers," *Insider* (2019), https://www.insider.com/schools-are-turning-to-vape-detectors-snuff-out-bathroom-smokers-2019-9.

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restrooms. An even more typical limitation has been that the installation of vape sensors in one place has often resulted in students simply moving to other areas to vape. For example, students can vape in classrooms, locker rooms, alcoves, and stairwells and other difficult to supervise indoor areas if vape sensors are only installed in student restrooms.

8. **While SFUSD has security camera systems at all 31 secondary schools, we find that considerable enhancements of the camera systems will be required to effectively prevent and detect student vaping activities.**

Our assessments show that while all 31 secondary schools in SFUSD have security cameras, they are very dated analogue cameras. The quality, types, capabilities, and placement of the cameras are not adequate to properly support the type of comprehensive strategy required to enable the District to effectively prevent and address the unique challenges of students vaping at its schools. Additionally, numerous building administrators advised our analysts that many of their cameras were not functioning. Therefore, for SFUSD we recommend a camera system with good quality cameras and array of placement that will provide the capabilities needed to support the strategy to prevent and detect student e-cigarette use.

Additionally, none of the schools are equipped with smart cameras with analytic software. This type of camera and software will allow prompt detection of potential problematic behaviors. When an anomaly or specific pattern of human behavior at a specific area is detected by the system, the analytic software will cause the video feed for the camera in the area to open up on the monitoring screen(s) so authorized personnel can evaluate the activities captured by the camera to determine if there is a problem. For example, if three students loiter in a stairwell for longer than the specified time programmed into the cameras and software, the software will cause the video feed for the cameras for the stairwell area to pull up on the monitoring screen(s). If the video analytic software is set to link with an alert notification system, it can also be programmed to send alerts to authorized personnel when the software detects something that meets its search criteria.

Due to their capabilities, smart cameras with analytic software have been increasingly utilized in K12 schools to address a wide array of school safety issues related to student misbehavior as well as accidents and medical emergencies. Smart cameras with proper analytics can detect many types of situations with a reasonably high degree of reliability, such as:

- Students who loiter in a stairwell to vape for a set amount of time such as 30 seconds.

- Students entering "No Go" zones and off-limits areas during specified time periods or to get to a difficult to supervise area or to attempt to leave a campus to use e-cigarettes.

- Students attempting to gain rooftop access to vape.

- A student falling down, which can be indicative of medical emergencies that are sometimes associated with vaping.

Because of their extremely robust and beneficial capabilities, smart cameras with analytic software are becoming increasingly effective and valuable in helping school officials in their efforts to prevent and detect students who engage in vaping. For example, smart cameras with what is known as "self-learning" analytic software can sometimes be configured in order to help school personnel more easily

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detect some specific behaviors indicative of students attempting to engage in or conducting vaping activities such as a rapid hand to mouth gestures.

When combined with the use of vape sensors, smart cameras with analytic software can help school personnel detect vaping behaviors and investigate potential vaping incidents much more effectively, with greater speed and less time and effort. One concern expressed by some school officials who have installed vape sensors in student restrooms is that by the time a school staff member can respond to a restroom where a vape sensor has been triggered, the student(s) involved have often already left the area. School officials have reported that they must often then pull camera footage, and then spend considerable time moving from one camera view to another to see where the students who were in the restroom at the time of the alert came from and where they went to after leaving the restroom. Opening and closing multiple cameras and reviewing the footage captured by each can be not only quite time consuming but ineffective as well because by the time school staff locate and, if appropriate, search the student(s) for e-cigarette devices and supplies, the students have often had ample time to hide or pass the e-cigarette contraband to other students to avoid detection.

In addition to the automated detection of these and other types of anomalies so a human can quickly evaluate the situation to make a further determination, modern smart cameras and analytic software can also make it much easier, quicker, and more efficient for school personnel to determine where a student who has engaged in inappropriate behavior has travelled on the campus both before the detected anomaly and afterwards. When used for e-cigarette use deterrence and prevention, current smart camera technology allows school officials to quickly and easily track where a particular student or students who are suspected of vaping have moved about a school before as well as after an alert from a vape sensor or an alert from analytic software is received. This technology can also make it much easier to investigate a tip regarding vaping violations, thus enhancing the use of anonymous tip reporting systems utilized by many schools.

Using this technology, the administrator can place a "box" on a unique feature of that student's attire (such as a pair of red and green tennis shoes or a yellow ball cap), and the software could rapidly pull the footage showing where the student came from prior to the incident being investigated and where they went after they are suspected of having used an e-cigarette. This would enable the administrator to determine in just a few minutes who most likely used the device in comparison to spending up to several hours trying to isolate footage of the vaping incident from a conventional camera and then determine who the student was and where they went in a large school with hundreds and in many cases several thousand students.

We note that this type of technology is not only helpful in identifying and deterring vaping incidents but can also help school officials clear the names of students who have not engaged in vaping activities. For example, if a student uses a vape device in a restroom or other area, goes to a locker they share with another student, and places the device and vape supplies in the locker mate's belongings to avoid detection, this type of camera technology would typically clarify the sequence of events and clear the innocent student in a matter of minutes. This type of capability can be particularly important because we have worked on other projects that involved incidents of students attempting to "frame" innocent students by hiding contraband in a victim's clothing, book bag, purse, or student locker. While Safe Havens analysts and others have fortunately been able to prove the innocence of dozens of students in

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these types of situations over the years, there have also been other instances where a student suffered significant consequences such as expulsion and arrest before proof that they were innocent was found.

In addition, smart cameras with proper analytics can also help school officials safeguard against the possibility that a student might attempt to tamper with or disable a vape sensor. When combined with real-time tamper alert technology now available for vape sensors, this type of analytic software can help school officials rapidly identify which students were in the location where the vandalism occurred, thereby speeding up the investigation process. This in turn can serve as a powerful deterrent to students who might otherwise try to damage vape sensors to avoid being caught vaping. Therefore, the use of vape sensors in combination with smart cameras with analytic software can help significantly reduce vaping in a given location, reduce the time school personnel must devote to investigating alerts, help clear innocent students, and safeguard against and deter potential tampering with vape sensors.

The tremendous advancements in reliable video analytic and smart camera technology have created not only dramatically improved investigation capabilities, but also increased ability to detect and identify those who are about to engage in misconduct as described in the discussion of loitering and "No Go" zone detection. Importantly, the improved capabilities resulting from the use of these systems can now also be used by school officials to create significantly increased deterrent value as students learn how easily they can be caught if they use e-cigarettes at school. These technologies can be even more effective when combined with a proper array of policies, procedures, staff development, student awareness efforts, improved student supervision, e-hall-pass systems, effective and evidence-based cessation programs, and other components that collectively create a holistic and comprehensive strategy based on and tailored to local conditions.

Therefore, we recommend a smart camera system with analytic software for SFUSD secondary schools to properly support the type of comprehensive strategy required to increase the ability of school officials to deter, detect, and investigate instances of student e-cigarette use, thus provide support needed for other components of the comprehensive strategy to enable the District to effectively prevent and address student e-cigarette use.

Another important component of a security camera system is video management system ("VMS"). A robust VMS enables the consolidation of capturing, recording, storing, retrieving, viewing, and analyzing of video footage, and allows for the management and utilization of a camera system more effectively and efficiently. Additionally, a quality VMS solution also allows the integration of a camera system with other security technologies such as access control or vape detection systems. Therefore, a VMS is needed to accommodate the additional cameras and to integrate the cameras and other technologies as part of a comprehensive, multi-disciplinary strategy to prevent and address student e-cigarette use at schools. Since SFUSD district-level personnel reported that the current VMS is not being utilized nor maintained, we recommend a new VMS system for SFUSD as part of the strategy. The District will also need additional VMS infrastructure to accommodate the additional cameras and vape sensors.

9. **There are potential opportunities for improvement in the use of magnetic holdback devices on hallway fire doors and stairwell doors at SFUSD secondary schools to increase natural surveillance for the areas.**

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Magnetic holdback devices help keep doors in the open position but will release the doors so they will close automatically if the fire alarm is activated. If and when they can be utilized, we find magnetic holdback devices on doors to be extremely beneficial in enhancing safety, security, and emergency preparedness. The use of magnetic holdback devices allows for hallway, corridor, and stairwell doors to be kept open to increase natural surveillance while still maintaining compliance with fire codes. This approach provides multiple safety and security benefits, including, but not limited to:

- This practice can improve student supervision on a daily basis because staff can see and hear students in areas where these doors are in use.

- Increasing natural surveillance for the stairwells and reducing the chances that stairwells become locations for illicit or unwanted behaviors such as vaping because the use of these devices can reduce the ability of students to detect approaching staff by the sound of doors being opened to enter the area.

- Increasing the ability of students and staff to hear indications of a safety situation in other parts of the school. This approach can be of critical importance in situations where a student may experience a medical emergency because of e-cigarette use.

Our analysts found that many of the secondary schools in SFUSD do not have magnetic holdback devices for hallway fire doors and stairwell doors. Therefore, implementation of these devices should be considered in future new school construction and renovation projects.

10. **None of the 31 secondary schools in SFUSD reported the use of nicotine or THC detection swabs**.

Nicotine and THC (an active ingredient in marijuana) residue detection swabs are a field test used by some school districts and law enforcement officials to determine if particles from vaping are present on devices and, in the case of THC swabs, they can be used to try to detect trace particles on a student's hands and/or clothing. As discussed above, it is very difficult for school staff to detect if a student has vaped because even if a student is caught with a vaping device, it is not usually apparent whether the student was using nicotine or THC oil. However, the use of nicotine and THC residue detection swabs can help address this challenge. For example, if a vape sensor goes off in a restroom with five students and indicates detection of nicotine, nicotine swabs can help rapidly determine if any devices found have residue of nicotine. THC swabs can be used in the same fashion. In addition, if a vape sensor alert indicates THC oil in the protected location, a field test can be used to determine if THC residue is present on any e-cigarette that is located. If adequate cause for suspicion justifying their use exists, THC oil swabs can then be used to try to detect the residue of THC oil on the hands, clothing, or face of an individual who has recently used THC oil with an e-cigarette.

A combination of the use of vape sensors, smart cameras with analytic capabilities, and nicotine or THC residue swabs can significantly improve the ability of school officials to detect students who have been using nicotine or THC and, conversely and of great benefit, can also sometimes be used to clear innocent students who, while in the area, have not used an e-cigarette. Since our assessments found that no secondary schools in SFUSD use nicotine or THC detection swabs, we recommend the use of these

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swabs as part of the comprehensive strategy required to enable the District to effectively prevent and address the problem of student e-cigarette use.

> **11. There are opportunities for improvement in the use of "Walking Only" and "No Go" zones to make it easier for staff to supervise students more effectively at the assessed schools.**

One challenge for school officials we have observed in other projects involves students gathering in groups in a manner that makes it possible for students to engage in inappropriate behaviors with little concern that they will be spotted by staff as they are shielded from view by the crowd. The use of "Walking Only" zones (which are designated physical spaces/areas where students are allowed to move through them but are prohibited from stopping, gathering, or loitering during specific time periods) can help limit students from gathering at a location. In relation to e-cigarette use, this approach, if properly enforced, can reduce the chances students will gather in the areas that are difficult for staff to supervise students using natural surveillance or via camera systems, making it more difficult for students to vape in those areas.

Another technique that can be helpful is the creation of "No Go" zones, which involves the designation of specific physical spaces/areas where students are not allowed to enter or pass through during specific time frames. "No Go" zones can be designated for spaces that students would pass through to get to a hard to supervise indoor or outdoor area to vape. Smart cameras with proper analytic software can be programmed to detect individuals passing through or entering "No Go" zones during specified time periods. This can make it much easier for staff to detect one or more students who are attempting to travel to a difficult to supervise area and can create a significant deterrent to students who might otherwise attempt to do so.

Another technique that can be effective in some schools where the building design is favorable for its use involves the creation of "One Way" hallways and/or stairwells to help reduce jamming of those areas during peak times of movement such as during class changes. This concept can make it easier for staff to more effectively supervise students in-person and/or via cameras during periods of increased student movement.

These approaches are more cost-effective than the traditional approach of hiring campus monitors to supervise each of these types of areas. Our assessments revealed that 20 of the 31 secondary schools (64.52%) in SFUSD have not established "Walking Only" zones; seven of the schools (22.58%) have not made use of "No Go" zones; and 25 of the schools (80.65%) did not have areas designated as "One Way" zones. Since the use of these zones is cost-effective and can help schools address the issue of students vaping, when practical and appropriate, this approach should be considered to further augment the other strategies designed to reduce student use of e-cigarettes.

6.5.   Conclusion

Our assessment revealed that while SFUSD has devoted considerable time and energy in an attempt to prevent and address the problems of e-cigarette use by students on school property, the pervasiveness of and unique challenges resulting from the problem cannot be adequately addressed with current resources. While our assessment showed that e-cigarette use is extremely pervasive at nearly all SFUSD

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secondary schools, the assessment did not show evidence that the following three schools have a significant issue with student e-cigarette use:[114]

- Bessie Carmichael Middle School

- Marina Middle School

- Rooftop Alternative School

We have identified a number of significant opportunities for improvement in the deterrence and prevention of e-cigarette use by students that should be implemented to address the problem. We note that the majority of those opportunities for improvement require substantial resources that are beyond those available to the District at this time. While we have also identified some opportunities for improvement SFUSD can begin implementing with current resources, these enhancements and current efforts will not be sufficient to properly address student e-cigarette use. We finally note that when practical, opportunities for improvement identified in this report should be addressed in concert with one another. The many challenges created by student e-cigarette use can be addressed most effectively when these improvement opportunities are deployed together where possible.

7. Summary of Opinions

For the convenience of the reader, the following is a summary of the major opinions that I hold in this case. This is not a substitute for the more detailed opinions set forth in this report, or a substitution for any facts relating to or supporting those opinions.

1. Due to numerous factors driving students to use e-cigarettes, SFUSD school officials have faced significant challenges in their efforts to address the epidemic of student e-cigarette use at their secondary schools.

2. Student e-cigarette use on school property at SFUSD has created a pervasive and highly negative impact on the safety, learning and social environment at schools in the District.

3. While SFUSD has expended significant efforts to prevent and address the problem of e-cigarette use by secondary school students on school property, the inability to effectively address the key driving factors of e-cigarette use among students demonstrate that the current measures in SFUSD secondary schools are woefully inadequate to properly address the problem.

4. In order for SFUSD to properly and effectively prevent and address the problem of secondary school students using e-cigarettes on school property, a comprehensive and multi-disciplinary strategy tailored to fit the local conditions is necessary.

5. In order for SFUSD to implement and maintain the customized comprehensive and multi-disciplinary strategies, significant short-term as well as long-term funding will be required.

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[114] As noted throughout this report, e-cigarettes have a discreet appearance and can be rapidly used in stealthy ways. As a result, personnel at these schools may have failed to detect student e-cigarette use that has occurred at the schools.

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6. In order for the comprehensive, multi-disciplinary strategy to prevent and address student e-cigarette use at schools to achieve a high degree of effectiveness, SFUSD will need to continually measure, test, re-evaluate, and, if and as needed, make adjustments to the strategy using a structured approach.

All of my opinions in this report are stated to a reasonable degree of professional or scientific certainty within the field of school safety, security, climate and culture and, more probably than not, are necessary to significantly reduce or eliminate the problem of student e-cigarette use in SFUSD. I reserve the right to amend this report if other evidence becomes available. Such information may or may not change the opinions rendered in this evaluation.

8. Opinions

The following are my opinions including the factual and professional bases for those opinions:

1. **Due to numerous factors driving students to use e-cigarettes, SFUSD school officials have faced significant challenges in their efforts to address the epidemic of student e-cigarette use at their secondary schools.**

The pervasiveness and the significant surge in e-cigarette use among U.S. youth prompted the U.S. Surgeon General to declare it as an epidemic in December 2018.[115] A comparison of similar surveys at the national level and for SFUSD demonstrates that student e-cigarette use is a significant and pervasive problem in the District's secondary schools.

According to the Youth Risk Behavior Survey (YRBS) for SFUSD in 2019 (the most current survey available), 31.1% of high school students and 8.8% of middle school students in the District reported having ever used e-cigarettes. The survey also shows 16.0% of high school students and 3.7% of middle school students in the District reported being current e-cigarette users.[116] Nationwide, the National Youth Tobacco Survey (NYTS) survey for the same year shows 46.9% of high school students (approximately 7.04 million) and 19.9% of middle school students (2.35 million) reported having ever used e-cigarettes. The 2019 NYTS also shows 27.5% of high school students (4.11 million) and 10.5% of middle school students (1.24 million) reported current e-cigarette use.[117] While the data from these surveys shows that the percentage of secondary school students in SFUSD who reported having ever

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[115] https://www.cdc.gov/tobacco/basic_information/e-cigarettes/surgeon-general-advisory/index.html

[116]
https://nccd.cdc.gov/youthonline/App/Results.aspx?TT=C&OUT=0&SID=HS&QID=H35&LID=SF&YID=2019&LID2=&YID2=&COL=S&ROW1=N&ROW2=N&HT=QQ&LCT=LL&FS=S1&FR=R1&FG=G1&FA=A1&FI=I1&FP=P1&FSL=S1&FRL=R1&FGL=G1&FAL=A1&FIL=I1&FPL=P1&PV=&TST=False&C1=&C2=&QP=G&DP=1&VA=CI&CS=Y&SYID=&EYID=&SC=DEFAULT&SO=ASC;
https://nccd.cdc.gov/Youthonline/App/Results.aspx?TT=C&OUT=0&SID=MS&QID=M22&LID=SF&YID=2019&LID2=&YID2=&COL=T&ROW1=N&ROW2=N&HT=QQ&LCT=LL&FS=S1&FR=R1&FG=G1&FA=A1&FI=I1&FP=P1&FSL=S1&FRL=R1&FGL=G1&FAL=A1&FIL=I1&FPL=P1&PV=&TST=False&C1=&C2=&QP=G&DP=1&VA=CI&CS=Y&SYID=&EYID=&SC=DEFAULT&SO=ASC

[117] Teresa W. Wang et al., "Tobacco Product Use and Associated Factors Among Middle and High School Students — United States, 2019," *Morbidity and Mortality Weekly Report 68*(12), 2019: 1-22, https://www.cdc.gov/mmwr/volumes/68/ss/pdfs/ss6812a1-H.pdf

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used e-cigarettes or being current e-cigarette users was lower than the national average, the YRBS data still indicates that student e-cigarette use at SFUSD is both pervasive and is having a significant impact on the District's students and schools.

Unlike combustible cigarettes, e-cigarette devices come in a wide range of shapes, sizes, and designs, which are often discreet in appearance; and many of them, such as multiple devices that have been marketed by JUUL, have a "high-tech" look and some e-cigarettes have been designed to look just like pens, USB devices, asthma inhalers, car key fobs, mobile phones, or even candy containers.[118] Unlike other cigarette products, e-cigarettes can be quickly used and do not generate the pungent odor and highly visible smoke common to combustible cigarettes. This makes e-cigarette use harder for school officials to detect.

As demonstrated below, the numerous factors that drive student e-cigarette use have created challenges for school officials that are unique and more difficult than many other school safety problems I have encountered in my decades of experience in the field of school safety. The following table shows the reasons for use of e-cigarettes by students from 2016-2020, in the order of the most to least common reasons found in the 2020 NYTS survey:

No.	Reason		Percentage of students who reported ever using e-cigarettes selected the reason*				
			2020	2019	2018	2017	2016
1	I was curious about them		52.7	55.3	-**	-**	-**
2	A friend used them	Friend or family member used them (as asked in surveys 2016-2019)	43.5	30.8	41.4	43.2	39.2
3	A family member used them		12.2				
4	I can use them to do tricks		19.4	21.2	-**	-**	-**
5	They are available in flavors, such as mint, candy, fruit, or chocolate		16.9	22.4	30.4	27.9	30.3
6	I used them for some other reason		16.6	14.4	27.3	26.1	30.5
7	I can use them unnoticed at home or at school		11.7	13.9	-**	-**	-**
8	They are less harmful than other forms of tobacco, such as cigarettes		10.0	15.7	19.8	16.6	17.8
9	They are easier to get than other tobacco products, such as cigarettes		4.1	5.4	4.9	4.5	5.2
10	To try to quit using other tobacco products, such as cigarettes		3.8	5.5	7.1	6.0	6.4
11	I've seen people on TV, online, or in movies use them (or "Famous people on TV or in movies use them" as in		3.0	4.4	1.8	2.1	1.9

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[118] Divya Ramamurthi, Cindy Chau, & Robert K. Jackler, "JUUL and Other Stealth Vaporisers: Hiding the Habit from Parents and Teachers," *Tobacco Control 28*(6, 2018): 610-616. DOI: 10.1136/tobaccocontrol-2018-054455.

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No.	Reason	Percentage of students who reported ever using e-cigarettes selected the reason*				
		2020	**2019**	**2018**	**2017**	**2016**
	surveys 2016-2018)					
12	They cost less than other tobacco products, such as cigarettes	2.1	3.8	3.9	3.4	3.4
13	They can be used in areas where other tobacco products, such as e-cigarettes, are not allowed	-**	-**	5.2	4.0	6.3
14	I was peer pressured into using them	-**	10.7	-**	-**	-**

Table 3: *Reasons for e-cigarette use among middle and high school students who reported ever using e-cigarettes – National Youth Tobacco Survey, United States, 2016-2020.*[119]

    *Participants who responded "yes" to the question "Have you ever used an electronic cigarette or e-cigarette, even once or twice?"

    **The answer choice was not on the survey questionnaire.

Other studies have reached similar findings. For example, the study conducted by Bold et al. in 2016 also shows curiosity as one of the most common reasons for e-cigarette use among students.[120] This study also found flavors of e-cigarettes and seeing friends and family members using e-cigarettes as key reasons for e-cigarette use among students. The study by Meernik et al. had similar findings regarding the positive association between e-cigarette flavors and e-cigarette use among youth. In reviewing 51 peer-reviewed articles published on e-cigarette use behaviors and perceptions through March 2018, the researchers found that e-cigarettes flavored with non-menthol flavors (such as fruit or candy flavors) decrease the perception of harm of e-cigarettes among survey respondents (in five studies) and increase the possibility of e-cigarette use or initiation of use (in six studies) among youth and young adults.[121]

Unfortunately, many e-cigarette users were not aware that e-cigarettes such as JUUL contain nicotine and perceived e-cigarettes as being less harmful than combustible cigarettes. Data from an online survey among youth and young adults (aged 15-24 years) in 2017 showed that 63% of respondents who identified themselves as current JUUL users were not aware that the product always contains nicotine.[122] Similarly, in their review of available studies (65 studies from 72 articles), researchers found that data from those studies showed that e-cigarette users generally perceived e-cigarettes as being less harmful.[123]

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[119] CDC, *National Youth Tobacco Survey*, https://www.cdc.gov/tobacco/data_statistics/surveys/nyts/index.htm.

[120] Krysten W. Bold et al., "Reasons for Trying E-Cigarettes and Risk of Continued Use," *Pediatrics 138*(3), 2016:1-8, DOI: 10.1542/peds.2016-0895.

[121] Clare Meernik et al., "Impact of Non-Menthol Flavors in E-Cigarettes on Perceptions and Use: An Updated Systematic Review," *BMJ Open 9*(e031598), 2019: 1-17, DOI: 10.1136/bmjopen-2019-031598.

[122] Jeffrey G. Willett et al., "Recognition, Use and Perceptions of JUUL Among Youth and Young Adults," *Tobacco Control 28*(1, 2019): 115-116, DOI: http://dx.doi.org/10.1136/tobaccocontrol-2018-054273.

[123] Kim A. G. J. Romijnders et al., "Perceptions and Reasons Regarding E-Cigarette Use among Users and Non-Users: A Narrative Literature Review," *International Journal of Environmental Research and Public Health 15*(1190), 2018:1-19, DOI: 10.3390/ijerph15061190.

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All these reasons for e-cigarette use among youth, or driving factors of e-cigarette use, pose various challenges to schools' efforts to prevent and address e-cigarette use among middle and high school students. For example, the youth who listed the ability to use e-cigarettes without being detected at school or at home is not only indicative of a driver of use, but also describes why it is so difficult for school personnel to prevent and address e-cigarette use. School personnel are stakeholders who can take action to prevent student e-cigarette use, as the U.S. Surgeon General pointed out in a 2016 report on e-cigarette use among youth and young adults.[124] It is critically important that these stakeholders are aware of e-cigarette products and the harmful health effects of e-cigarette use on young people.

However, as many e-cigarette products have a discreet appearance and can be rapidly used in stealthy ways, school personnel have found it challenging for them to detect if a student possesses and or uses e-cigarette devices. In fact, as Schillo et al. found in their survey of 1,420 U.S. middle and high school teachers and administrators in 2019, while 67.6% of respondents reported that they had heard of JUUL as a vaping product, only 47.3% of them correctly identified a photo of a JUUL as a vaping device.[125] The results of the assessment at all 31 secondary schools in SFUSD conducted by Safe Havens (Section 6) also show that administrators at 26 (83.87%) of the schools acknowledged that staff at their schools lack awareness of how to recognize a wide array and various types of e-cigarette devices.

This lack of knowledge about e-cigarettes among school personnel significantly affects the efforts of school officials to address the problem of student e-cigarette use. The study by Schillo et al. also showed that the respondents who identified themselves as working in a school with an e-cigarette policy in place reported that the discreet appearance of e-cigarette devices (65.6%) and the difficulties in identifying the origin of vapor or scent to detect e-cigarette use (46.1%) made it difficult for them to enforce the policy.

Due to the significant challenges in addressing e-cigarette use among students, some schools have implemented severe measures such as removing the doors to individual stalls in student restrooms. One such instance of this can be seen in media reports of school officials in Florence, Alabama being criticized by parents after the principal decided to remove stall doors in boy's restrooms at Wilson High School.[126] The school's principal stated that he decided to take this action following a medical emergency where a student lost consciousness while vaping in the restroom.

Another barrier to preventing youth e-cigarette use is the parents'/guardians' lack of knowledge about e-cigarette products and the harmful health effects of e-cigarette use on children, teenagers, and young adults. According to a 2019 national survey of parents of U.S. middle and high school students, while most parents (96.2%) had seen or heard of e-cigarettes, less than half of the parents (44.2%) could

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[124] U.S. Department of Health and Human Services, *E-cigarette use among youth and young adults: A report of the Surgeon General,* Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2016, https://e-cigarettes.surgeongeneral.gov/documents/2016_SGR_Full_Report_non-508.pdf.

[125] Barbara A. Schillo, "JUUL in School: Teacher and Administrator Awareness and Policies of E-Cigarettes and JUUL in U.S. Middle and High Schools," *Health Promotion Practice* 21(1, 2020): 20-24, DOI: 10.1177/1524839919868222.

[126] https://www.newsweek.com/alabama-school-bathroom-vaping-1458376

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accurately identify an image of JUUL as a type of e-cigarette, and less than one-third of the parents (32.9%) were concerned about their own child's use of e-cigarettes.[127]

As detailed later in this report, it has been my experience that these challenges create school safety problems that are beyond the available resources and capabilities of most public school systems to effectively address. As also detailed later in this report, traditional school safety, prevention, and intervention measures, strategies, and technologies used for problems such as drugs, alcohol, weapons, etc. have been proven to be inadequate to address the epidemic of e-cigarette use by students on school property. In my more than 40-year career in school safety, I have never encountered a risk that poses the unique challenges for school officials to try to maintain a safe learning environment as e-cigarettes have created.

2. **Student e-cigarette use on school property at SFUSD has created a pervasive and highly negative impact on the safety, learning and social environment at schools in the District.**

According to the results of Safe Havens' Assessment (Section 6), SFUSD secondary school students reportedly use e-cigarettes in various areas on school property. Based on the responses from administrators at the assessed schools, student restrooms and outdoor areas are the most problematic areas reported for vaping activities. The next most problematic areas are classrooms, stairwells, hallways, gymnasiums, alcoves, and auditoriums. The fact that students have been using e-cigarettes in various areas on school property has created a pervasive negative impact on the safety, learning, and social environment of SFUSD secondary schools as well as the District as a whole. As Safe Havens' assessment found, SFUSD personnel reported that e-cigarette use by students was highly disruptive even though the District has committed substantial resources to try to address the problem. The District has implemented various measures, in policies and practices, to address the issue of students vaping or using e-cigarettes. The following are some examples of the District's significant efforts using either its own fiscal resources and/or grant funding to prevent and address the issue:

- SFUSD has a Board policy that addresses the issue of students using e-cigarettes (policy 5140.2).

- The District has frequently conducted surveys of students to gauge behaviors that increase health risks including cigarette use since 2009.

- The District has formed and participated in task forces and working groups to address cigarette use by students since 2012.

- The District has provided elementary, middle, and high school students with classes on the topics related to cigarette use since 2012.

- The District has cessation classes and programs for students who violate Board policy on cigarette use.

- The District has provided parents of middle and high school students with informational materials and workshops on the problem of e-cigarette use.

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[127] Minal Patel et al., "Parents' Awareness and Perceptions of JUUL and Other E-Cigarettes," *American Journal of Preventive Medicine 57*(5, 2019): 695-699, DOI: 10.1016/j.amepre.2019.06.012.

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These efforts have created a severe drain on the District's limited resources, preventing the District from providing other much needed types of student support and life-safety efforts. As detailed in Safe Havens' Assessment (Section 6), SFUSD personnel reported to Safe Havens' analysts that e-cigarette use by students was highly disruptive to the operation of their schools, interfered with educational processes, and created a significant drain on their limited resources. For example, District personnel reported that one major challenge has been that vaping has impacted certain subgroups of students who, in some cases, are at increased risk, particularly at middle and high school. The personnel also expressed significant concerns about the short and long-term health and well-being of students who use e-cigarettes and the impact of health problems on the ability of students to succeed in school. Many students who use e-cigarettes have been having considerable trouble in terms of academic achievement due to increased difficulty staying focused in class and when studying.

School personnel I have interacted with in multiple school districts have reported that pervasive e-cigarette use by students in their schools has resulted in significant loss of instructional time for staff and for students due to the disruption caused by vaping incidents, class time missed by students due to suspensions, time and human resources required for awareness programs for staff and students, preparation of student conduct violation paperwork, staff time required for intervention measures for vaping violations, court appearances, and other activities resulting from the problems caused by students vaping. In my experience, the interruption and loss of instructional time and loss of assistance often has the most negative impact on the students who have the greatest need for assistance.

In addition, the resources expended on the problem of e-cigarette use by students has degraded the level of security and life safety of many schools. I do not make this statement casually nor lightly. Based on my experience, the devotion of personnel and other scarce resources to address e-cigarette use results in less available resources for the prevention of serious injury and death posed by other life-safety hazards. School administrators, security personnel and school-based peace officers have spent many hours addressing e-cigarette use by students that as a result are not being focused on protecting staff, students, and visitors from other types of school safety hazards.

For example, school district security officers, school district peace officers, and police officers from local law enforcement agencies working in schools spend considerable time helping administrators investigate possible vaping incidents, preparing reports, tagging, and securing evidence, testifying in courthouses and other activities resulting from student e-cigarette violations. Every minute an officer assigned to a school spends in an office working on a report for a vaping case is a minute that he or she is not out and about on their assigned campuses to prevent safety incidents such as unsafe driving, non-custodial parental abductions of students or an attack by an armed intruder. While this may seem extreme to some who have never worked in law enforcement, my experience has been that school-based peace officers, school security personnel and school officials spend a great deal of time on each e-cigarette use case. Having spoken to school district police personnel, school resource officers, school security officers and building administrators who report spending several hours or more on each e-cigarette use violation, in my experience, e-cigarette incidents have severely impacted the time school personnel have available to spend protecting members of the school community from other dangers.

Another safety concern is that it has been common for students to share e-cigarettes in schools during the COVID 19 pandemic. This is not simply a theoretical concern as school officials are report situations

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where multiple students are being caught sharing e-cigarettes. There have been instances where a group of students had to be quarantined due to COVID concerns after sharing an e-cigarette. These highly concerning incidents align with my experience that children and youth often fail to comprehend the danger from hazardous activities like the use of e-cigarettes and sharing vape devices during a deadly pandemic. This further complicates the challenges that SFUSD officials face in addressing the problem of student e-cigarette use in schools. There are also additional risks posed by student e-cigarette use. One such risk involves the danger of fires and explosions of e-cigarette devices at school. The risk of environmental health, fire, and life safety resulting from e-cigarette device fires and explosions at schools caused enough concern to the New Jersey Safe Schools Program that it conducted a study on the issue.[128]

In general, I find that student e-cigarette use has resulted in a serious degradation of the life-safety in secondary schools where such use has been significant. Whether the potential hazard is a rare but catastrophic event like an active shooter, the risk of a serious medical emergency, or the types of incidents that claim far more lives like school parking lot fatalities, the problem of e-cigarette use and the drain on limited school safety resources in school districts, have, in my opinion, made schools less safe for students, staff, and visitors in the District.

3. **While SFUSD has expended significant efforts to prevent and address the problem of e-cigarette use by secondary school students on school property, the inability to effectively address the key driving factors of e-cigarette use among students demonstrate that the current measures in SFUSD secondary schools are woefully inadequate to properly address the problem.**

As compared to combustible cigarettes, e-cigarettes pose significantly more challenges to students and the school environment, as detailed throughout this report. As also described in this report, I found that many students and parents today are still not fully aware of the dangers of e-cigarette use by youths. Many School officials have reported that it is still not unusual for parents to argue with school officials that they should return e-cigarettes that have been confiscated from their children because the parents believe that vaping is a harmless activity.

As documented throughout this report, I find that the problems regarding e-cigarette use by secondary school students present a new and growing threat with significantly more challenges than combustible tobacco. However, in the absence of systematic guidance, schools have taken a patchwork approach in an attempt to address the problem. Schools have implemented various measures ranging from behavior-based prevention approaches such as e-cigarette-related policies and educational programs for students and staff to physical measures such as assigning staff for increased student supervision and using technologies for monitoring vaping activities. Like other school districts, SFUSD has been able to use proven measures to more effectively prevent and mitigate the problem of students using combustible cigarettes on school campuses. As shown in the YRBS for high school students at SFUSD, the number of students who reported current combustible cigarette use dropped significantly in the last 20

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[128] Maryanne L. Fakeh Campbell et al., "E-Cigarette Environmental and Fire/Life Safety Risks in Schools Reported by Secondary School Teachers," *BMC Public Health*, *20*(1215), 2020, https://doi.org/10.1186/s12889-020-09319-8.

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years – from 19.1% in 1997 down to only 6.5% in 2019 (the lowest percentage was 4.7% in 2017). [129] Meanwhile, the survey shows a significant increase in e-cigarette use among SFUSD high school students, from 13.3% in 2015 to a record high of 16.0% in 2019. [130] These survey results not only show the severity of the emerging problem of e-cigarette use by students at SFUSD but also demonstrate that the District has been struggling to combat the problem.

There has also been no well-established, nation-wide comprehensive set of prevention and intervention measures to address e-cigarette use among youth. In fact, the U.S. government also does not have well-established prevention and intervention measures specific for e-cigarette use by youth. Instead, in the 2016 report regarding the epidemic of e-cigarette use, the Surgeon General suggested the adoption of the broader approaches for combustible tobacco smoking detailed in the 2012 Surgeon General's report:

> *We know what works to effectively prevent tobacco use among young people. Now we must apply these strategies to e-cigarettes—and continue to apply them to other tobacco products.* [131]

While I find many of these strategies to be logical for helping to address student e-cigarette use, I also find they do not take into account changes in technology, student supervision approaches and other prevention and intervention measures – particularly as they relate to schools -- that have been developed and improved since the 2016 study was conducted. As discussed earlier, e-cigarette use has additional driving factors, which create challenges for school officials. To be successful and effective in preventing and reducing e-cigarette use among students using the high-level, general approaches the CDC recommends, school officials will need to implement an array of complementary and comprehensive multi-disciplinary strategies which can help them more effectively address many of the key driving factors of e-cigarette use.

Therefore, I find that the strategies that have traditionally been utilized to prevent and address the use of other tobacco products in schools are inadequate for the problems faced by SFUSD resulting from e-cigarette use without additional and more specific components. For example, many of the strategies that work effectively in preventing student tobacco use are not effective enough to help school officials address the quick and stealthy nature of e-cigarettes that allows it to be used at schools without being detected. As discussed above, the survey of 1,420 middle and high school teachers and administrators in the U.S. by Schillo et al. shows that while 82.9% of U.S. middle and high schools had an e-cigarette policy, the majority of teachers and administrators at those schools found it challenging for them to

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[129]

https://nccd.cdc.gov/youthonline/App/Results.aspx?TT=L&OUT=0&SID=HS&QID=H32&LID=SF&YID=YY&LID2=&YID2=&COL=S&ROW1=N&ROW2=N&HT=QQ&LCT=LL&FS=S1&FR=R1&FG=G1&FA=A1&FI=I1&FP=P1&FSL=S1&FRL=R1&FGL=G1&FAL=A1&FIL=I1&FPL=P1&PV=&TST=False&C1=&C2=&QP=G&DP=1&VA=CI&CS=Y&SYID=1997&EYID=2019&SC=DEFAULT&SO=ASC

[130]

https://nccd.cdc.gov/youthonline/App/Results.aspx?TT=L&OUT=0&SID=HS&QID=H35&LID=SF&YID=YY&LID2=&YID2=&COL=S&ROW1=N&ROW2=N&HT=QQ&LCT=LL&FS=S1&FR=R1&FG=G1&FA=A1&FI=I1&FP=P1&FSL=S1&FRL=R1&FGL=G1&FAL=A1&FIL=I1&FPL=P1&PV=&TST=False&C1=&C2=&QP=G&DP=1&VA=CI&CS=Y&SYID=2015&EYID=2019&SC=DEFAULT&SO=ASC

[131] HHS, 2016, 249.

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enforce the policy due to the discreet appearance of e-cigarette devices and difficulties in detecting the origin of vapor or scent.[132] The study demonstrates that having a school policy on e-cigarette use is not adequate to address the driving factor resulting from the discreet appearance and stealthy use of e-cigarettes. In order to address this driving factor, school officials will need more than just school policies on e-cigarette use. They will need training programs to increase awareness of emerging e-cigarette products among teachers and administrators and mechanisms to detect the possession and use of e-cigarettes by students at school.

As another example, a survey of 1,525 middle and high school teachers and administrators showed that schools have used various intervention measures to address the problem of students using e-cigarettes at schools such as installing camera surveillance near student restrooms (41%), limiting the number of students allowed in restrooms at one time (36%), limiting restroom time for students (30%), assigning teachers to restroom monitoring duty (23%), placing devices to monitor the air in student restrooms (12%), and removing student restroom doors (9%), among other measures.[133] While these measures help to at least partially address some factors such as access to and use of e-cigarettes at schools, they do not address other factors such as students' curiosity about e-cigarettes, school personnel and parents/guardians' lack of awareness of e-cigarette products, stealthy use of e-cigarettes, etc. In other words, these measures alone are not adequate to properly address the problem of students using e-cigarettes at schools.

As documented in the Safe Havens' Assessment (Section 6), SFUSD still faces significant challenges in addressing the issue. According to SFUSD suspension data for tobacco and drug related violations from the 2013-2014 SY through the 2019-2020 SY, incidents involving "possess/use tobacco/nicotine products" (California Education Code 48900(h)) accounted for the third highest number of suspensions for tobacco and drug related violations in the District in 2018-2019 SY and 2019-2020 SY.

The data also shows a significant increase (more than 200%) in suspensions for "possess/use tobacco/nicotine products" for the 2018-2019 SY and the 2019-2020 SY compared to the 2017-2018 SY. Since data from SFUSD student surveys showed a much higher number of middle and high school students who used e-cigarettes than those who reporting smoking, it is reasonable to assume that violations for possessing/using e-cigarettes accounted for the majority of suspensions for code "possess/use tobacco/nicotine products" violations at SFUSD during the 2018-2019 SY and 2019-2020 SY. In fact, according to the 2019 SFUSD High School Health Survey, the percentage of SFUSD high school students who currently used an e-cigarette in 2019 (16.0%) was approximately 2.5 times higher than the percentage of the students who currently smoked cigarettes (6.5%).

Similarly, according to the 2019 SFUSD Middle School Health Survey, the percentage of SFUSD middle school students who currently used an e-cigarette in 2019 (3.7%) was approximately 3.7 times higher than the percentage of the students who currently smoked cigarettes (1.0%). These survey results indicate that while the current prevention and intervention measures at SFUSD seem to be having an

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[132] Barbara A. Schillo, "JUUL in School: Teacher and Administrator Awareness and Policies of E-Cigarettes and JUUL in U.S. Middle and High Schools," *Health Promotion Practice* 21(1, 2020): 20-24, DOI: 10.1177/1524839919868222.
[133] Truth Initiative, "How Are Schools Responding to JUUL and the Youth E-Cigarette Epidemic?" 2019, https://truthinitiative.org/research-resources/emerging-tobacco-products/how-are-schools-responding-juul-and-youth-e-cigarette.

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impact on reducing the number of students smoking cigarettes, the measures are not proving to be effective in addressing the problem of e-cigarette use by students.

In reviewing the measures currently in place at schools in the U.S., I have yet to identify any school district that has developed a truly effective comprehensive strategy with measures that will address the majority of the key driving factors of e-cigarette use among students. As a result, in spite of various and significant efforts of school systems to address the problem of e-cigarette use, the current efforts of school districts have been insufficient to address the problem, as Richard Miech et al. pointed out in their report:

> *Current efforts by the vaping industry, government agencies, and schools have thus far proved insufficient to stop the rapid spread of nicotine vaping among adolescents. Of particular concern are the accompanying increases in the proportions of youth who are physically addicted to nicotine, an addiction that is very difficult to overcome once established. The substantial levels of daily vaping suggest the development of nicotine addiction. New efforts are needed to protect youth from using nicotine during adolescence, when the developing brain is particularly susceptible to permanent changes from nicotine use and when almost all nicotine addiction is established.*[134]

I base my conclusions not only on the work of this and other researchers, but also on the feedback of school officials from multiple school districts across the nation that I have interacted with. While the extent of the problems resulting from e-cigarette use varies between some school districts, most of the school officials I have spoken to during school safety projects and in my other work have expressed significant frustration and, in many instances, have even told me they are overwhelmed by the challenges that student e-cigarette use has created in their schools.

While SFUSD has expended significant effort and resources to address e-cigarette use by students as detailed above, due to the limited resources of this public school system as well as the pervasive negative impact and challenges created by the epidemic of e-cigarette use by students, I find that the prevention and intervention measures currently in place in the District are still inadequate to properly address the problem. For example, as detailed in Safe Havens' Assessment (Section 6), the following are some of the gaps identified in the current approaches used by the District:

- **Training programs for staff on the epidemic of student e-cigarette use**: Administrators at only seven (22.58%) of 31 secondary schools in the District reported that they provided their staff with awareness training on the issue of student e-cigarette use. This indicates that either this type of staff development is not a district-wide program at SFUSD, or the administrators at the other 24 (77.42%) of the 31 schools were not aware of any such training being available. At the seven schools that have the training for staff:
  - Only four (57.14%) schools require the training for all current employees while it is optional at the other three (42.86%) schools.

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[134] Richard Miech et al., "Trends in Adolescent Vaping, 2017–2019," *The New England Journal of Medicine 381*(15), 2019: 1490-1491, 1491, DOI: 10.1056/NEJMc1910739.

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- o Only four (57.14%) schools provide the training during the onboarding process for new personnel.

- o None of the schools provide the training to substitute teachers.

- o Only two (28.57%) schools provide the training in an online format to make it more convenient for staff to participate.

- **Training programs for students on the epidemic of student e-cigarette use**:

  - o *Awareness training for secondary school students*: According to the results of the California Healthy Kids Survey (CHKS), discussed earlier in this report, there is a significant lack of awareness of the harmful effect of vaping among SFUSD secondary students. These survey results also demonstrate a significant opportunity for improvement in awareness training programs for SFUSD secondary students on the harmful effects of e-cigarette use. In fact, administrators at only 19 (61.29%) of 31 SFUSD secondary schools reported that they provide an awareness training program for their students on the issue of student e-cigarette use. It appeared that either SFUSD does not have a standardized, district-wide awareness training program on e-cigarette use for students at secondary schools and some individual schools developed the program and provided it to their students, or administrators at the other 12 (38.71%) schools were not aware that the District has this type of program.

  - o *Cessation programs for student vaping violators*: Administrators at only 8 (25.81%) of 31 secondary schools in the District reported that they have a cessation program for students who violate e-cigarette policy. This finding indicates that either the District does not have a district-wide cessation program or that administrators at the other 23 (74.19%) schools were not aware of the availability of mandatory vaping awareness sessions for vaping violations.

  - o *Awareness of vaping policy*: The results of the 2019-2020 CHKS of SFUSD secondary school students show that 41, 52, and 43% of students in grades 7, 9, and 11, respectively, do not know if their schools have a policy that bans tobacco use and vaping on school property and at school sponsored events. These survey findings demonstrate significant need for increasing the awareness of SFUSD secondary school students regarding policies and educational programs on the dangers of vaping.

- **Awareness training program for parents on the epidemic of student e-cigarette use**: Only eight (25.81%) of the 31 secondary schools in SFUSD provide their parents with this type of training. This finding indicates that either SFUSD does not have standardized awareness training on the epidemic for parents of secondary school students and individual schools have to develop and provide the training themselves, or administrators at the other 23 (74.19%) were not aware such training exist in the District.

- **Staffing:** SFUSD is significantly understaffed to address the epidemic of student vaping. Neither SFUSD nor any of its secondary schools have any personnel assigned to serve solely or primarily in a capacity to provide oversight of vaping prevention and intervention efforts. Current staff

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who already have a very full workload with other tasks have had to handle additional duties to address the vaping epidemic resulting in a degraded ability of staff to perform the duties they were hired to perform. In my experience, the problems resulting from inadequate staffing will become even more intensive as the problem of students vaping becomes more pervasive. In my experience, the types of gaps I find between intended practices and actual practices for e-cigarette use prevention and intervention in SFUSD are typical of what I see when a school district does not have adequate staffing for oversight of key school safety efforts. I often find this type of gap for other school safety, security, and emergency preparedness measures in school districts. For example, it is fairly common for me to suggest that a school district consider adding one or more positions to provide oversight for school safety, security and emergency preparedness because I find gaps between stated and actual practice resulting from a lack of personnel dedicated to providing this type of coordination and oversight.

- **E-hall-pass system:** As detailed later in this report, an effective and properly utilized e-hall-pass system can significantly help school personnel with student supervision. Without an effective and highly robust e-hall-pass system, it can be extremely challenging for school personnel to determine if a student who is moving about the school has permission to do so or not. As a result, students in schools without effective e-hall-pass systems can and often do engage in inappropriate conduct such as smoking and e-cigarette use. As detailed in Safe Haven's Assessment (Section 6), none of the 31 secondary schools in SFUSD have an e-hall-pass system.

- **Vape sensors**: None of the secondary schools at SFUSD are equipped with any vape sensors. These types of sensors are very reliable in helping schools detect vaping activities. However, they are also relatively expensive. In my experience, many school districts have not had the funding to install vape sensors, especially in the proper numbers and locations required for large middle and high schools.

- **Camera systems for schools**: As detailed in Safe Havens' Assessment (Section 6), while all SFUSD secondary schools have security camera systems, the quality, types, capabilities, and placement of the cameras were not adequate to properly support the type of comprehensive strategy required to enable the District to effectively prevent and address students vaping at schools. Additionally, none of the schools are equipped with smart cameras with analytic software. When combined with the use of vape sensors, smart cameras with analytic software can help school personnel detect vaping behaviors and investigate potential vaping incidents much more reliably, with greater speed and less time and effort.

These are just some examples to illustrate that the prevention and intervention measures currently in place at SFUSD are inadequate to properly address the many challenges posed by the epidemic of student e-cigarette use. Based on available data on youth e-cigarette use and recent feedback from school officials who have re-opened their schools, I have not seen compelling evidence that the problems caused by student e-cigarette use in schools are going to cease to be a challenge in the near future. In fact, the above indicators instead lead me to conclude that e-cigarette use will more likely than not continue to be a significant problem in the District.

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As detailed in the next section, to properly and effectively address the epidemic of e-cigarette use by students, administrators and staff at SFUSD will need much more comprehensive strategies and resources to help them address key factors that drive students to use e-cigarettes on school campuses.

4. **In order for SFUSD to properly and effectively prevent and address the problem of secondary school students using e-cigarettes on school property, a comprehensive and multi-disciplinary strategy tailored to fit the local conditions is necessary.**

Strategies to address factors driving youth e-cigarette use are particularly critical.[135]

An effective strategy to prevent and address e-cigarette use among students should consider the key driving factors of e-cigarette use. In reviewing currently available research on the topic, I find data from the NYTS annual surveys to be helpful because the surveys have been conducted consistently every year with middle and high school students in the U.S. As shown in Table 3 earlier in this report, data from the NYTS surveys from 2016 to 2020 consistently show the following as key driving factors for e-cigarette use among students:

- "I was curious about them" (i.e., e-cigarette products)

- "A friend used them"

- "A family member used them"

- "I can use them to do tricks"

- "I can use them unnoticed at home or at school"

- "They are less harmful than other forms of tobacco, such as cigarettes"

- "I was peer pressured into using them"

I note that I did not include data from the 2021 NYTS survey, which was conducted during the COVID-19 pandemic, because the CDC advised the survey results should not be used to compare with previous NYTS results due to the "potential underreporting of tobacco use behaviors or other unmeasured characteristics among youths participating [in the survey] outside of the classroom."[136]

An effective strategy to prevent and address e-cigarette use among students at schools will have to incorporate approaches which address these key driving factors. As discussed above, the U.S. government suggests the adoption of the strategies proven effective to prevent and address combustible cigarette use for e-cigarettes. Those strategies, as detailed later in this section, rely on school policies as well as educational and cessation programs to address the problem. While I agree that the policy and training program-based prevention and reduction strategies have proven to be effective in preventing and reducing combustible tobacco use in schools to an extent and that they can help address the problem and should be applied to address student e-cigarette use because e-cigarettes contain nicotine, the utilization of those strategies alone is not adequate to address the unique driving

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[135] Teresa W. Wang et al., "E-cigarette Use Among Middle and High School Students — United States, 2020," *Morbidity and Mortality Weekly Report 69*(37), 2020, 1311.

[136] Eunice Park-Lee et al., "*Notes from the Field*: E-Cigarette Use Among Middle and High School Students — United States, 2011–2018," *Morbidity and Mortality Weekly Report 67*(16), 2018: 1276-1277.

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factors of e-cigarette use among students. The unique challenges in detecting vaping activities, let alone pinpointing which students in a group of students in a restroom or other area have used vaping devices, and the constant changes in designs of e-cigarette products make the utilization of approaches which are limited only to policy and training program-based measures inadequate to properly tackle the relatively new and evolving epidemic of e-cigarette use by students.

Based on my experience with a variety of school safety issues, my review and evaluation of the unique challenges of e-cigarettes, and the significant development of effective school safety technologies, I am highly confident that a locally tailored, comprehensive and multi-disciplinary strategy that includes the adoption of a blend of those proven effective policy and training program-based approaches and the utilization of school safety technology-based measures and practices is required to enable schools to be able to address most of the key driving factors of e-cigarette use among students at schools at SFUSD. In my opinion, this strategy will more likely than not allow the District to much more effectively prevent and intervene in student e-cigarette use. In general, such a strategy for SFUSD should include two complimentary components:[137]

1. The seven school-based strategies the CDC recommended for effective tobacco use prevention programs. Based on their in-depth review of available research and school-based tobacco use prevention programs, the CDC, in collaboration with experts from 29 national, federal, and voluntary agencies as well as authority leaders in the field, developed seven strategies to help school personnel develop and implement effective tobacco use prevention programs.[138] These strategies, when properly modified for e-cigarettes, will help school officials address some driving factors e-cigarettes share with other tobacco products, such as:

   - *Students' curiosity about e-cigarette products*: Educational programs for students with appropriate information will be able to help school officials address this driving factor.

   - *Seeing a friend or family member using e-cigarettes*: Educational and cessation programs for students, awareness training programs for parents/guardians, and school policies on e-cigarettes will help school officials partially address this factor. However, in order to properly and effectively address this factor, schools will need a variety of mechanisms to deter, prevent and intervene in student e-cigarette use at schools. The second component of my recommended strategy tailored to fit local conditions, as discussed below, will help school officials address this factor in ways that educational programs and school policies cannot.

   - *Peer pressure on students to try and use e-cigarettes*: Educational programs for students and parents/guardians will be able to help school officials address this driving factor.

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[137] I understand that other experts in this litigation with specialized expertise in youth tobacco use prevention are recommending strategies to address and reduce student e-cigarette use in SFUSD and that their recommendations are consistent with the general framework for tobacco use prevention established by public health authorities like the CDC. As it relates to the specifics of issues such as prevention education and counseling and cessations strategies, and the associated costs, I will defer to the recommendations of these experts.
[138] https://wonder.cdc.gov/wonder/prevguid/m0026213/m0026213.asp.

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- *The perception of e-cigarettes as being less harmful than other forms of tobacco*: Educational programs for students and parents/guardians will be able to help school officials address this driving factor.

2. A combination of various technology-based measures to improve student supervision, limit spaces favorable for e-cigarette use, to deter and when deterrence fails, to detect student e-cigarette use. As discussed in detail later in this report, these various technology-based measures will help school officials address all of these key driving factors simultaneously:

- "A friend used them"

- "I can use them to do tricks"

- "I can use them unnoticed at home or at school"

- "I feel peer pressured into using them"

Additionally, when feasible and as appropriate, the strategies in this report generally align with the 16 principles developed by the National Institute on Drug Abuse (NIDA) "to help prevention practitioners use the results of prevention research to address drug use among children, adolescents, and young adults in communities across the country."[139] Following are the components of a comprehensive, multi-disciplinary strategy that I recommend for SFUSD to effectively and properly prevent, intervene in, and reduce e-cigarette use by students at schools:

a. *Implementation of the seven school-based strategies the CDC recommended for effective tobacco use prevention programs*

The CDC has also developed seven strategies to help school personnel develop and implement effective tobacco use prevention programs.[140] In applying these strategies to e-cigarettes, school districts should modify them to fit with the unique challenges, usage patterns, and negative health effects of e-cigarette products. Where feasible and appropriate, these should be tailored to align with the recommendations which incorporate approaches that are outside of the expertise of the CDC personnel who developed these very useful strategies. My recommendations generally already align with these seven strategies but include more specific information on how to support and implement the CDC's recommended strategies.

i.   Schools should develop and enforce school policies on cigarette use.

Schools use policies to instruct, guide, and regulate students' behavior; therefore, policies play significantly important roles in school safety. However, not all policies are effective in helping schools achieve the goals of the policies. To be effective, policies will need to be practical and enforceable as well as implemented and enforced. Studies have shown that school policies banning cigarette use were associated with a positive effect on students smoking only when the policies were strongly enforced or

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[139] National Institute on Drug Abuse (NIDA), "Lessons from Prevention Research DrugFacts," 2014, 1, https://www.drugabuse.gov/publications/drugfacts/lessons-prevention-research.
[140] https://wonder.cdc.gov/wonder/prevguid/m0026213/m0026213.asp.

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when most students perceived that the policies were enforced.[141] Similarly, in the area of e-cigarettes, based on the results of their national survey of 1,420 middle and high school teachers and administrators, Schillo et al. concluded that adoption and enforcement of school policies on e-cigarette use are critical to prevent and address e-cigarette use among students.[142]

According to the CDC, a school policy on cigarette use should include the following elements:

- Must be consistent with state and local laws.

- Include the rationale for preventing cigarette use by students.

- Prohibit cigarette use by students, school staff, parents/guardians, and visitors on school property, in school vehicles, and at school-sponsored functions away from school property.

- Prohibit cigarette advertising in school buildings, on school vehicles, at school functions, and in school publications.

- Require that all students receive instruction on how to avoid using cigarettes.

- Include provisions for students and school staff to have access to programs to help them quit using cigarettes.

- Include procedures for communicating the policy to students, school staff, parents/guardians, visitors, and the community.

- Include provisions for enforcing the policy.

To gain wide support for the policy, the CDC suggests schools include representatives of relevant groups such as students, parents/guardians, school staff, and school board members in the process of developing and implementing the policy. I have found this approach to be extremely beneficial for more effective implementation and to maintain and enhance school climate. Additionally, I suggest that, when possible, schools should include the e-cigarette policies in their employee handbooks, student handbooks/student codes of conduct, in social media campaigns, websites, new student orientations, employment application packages and onboarding processes for new employees, substitute personnel and volunteers.

      ii.   <u>Schools should provide instruction about the short- and long-term negative physiologic and social consequences of cigarette use, social influences on cigarette use, peer norms regarding cigarette use, and refusal skills.</u>

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[141] Melanie A. Wakefield et al., "Effect of Restrictions on Smoking at Home, at School, and in Public Places on Teenage Smoking: Cross Sectional Study," *BMJ (Clinical research ed.) 321*, 2000, 333-337, DOI: 10.1136/bmj.321.7257.333; Donna A. Murnaghan et al., "A Multilevel Analysis Examining the Association Between School-Based Smoking Policies, Prevention Programs and Youth Smoking Behavior: Evaluating a Provincial Tobacco Control Strategy," *Health Education Research 23*(6), 2008, 1016-1028, DOI: 10.1093/her/cyn034; Scott T. Leatherdale & Adam Cole, "Examining the Impact of Changes in School Tobacco Control Policies and programs on Current Smoking and Susceptibility to future Smoking Among Youth in the First Two Years of the COMPASS Study: Looking Back to Move Forward," *Tobacco Induced Diseases 13*(8), 2015:1-13, DOI 10.1186/s12971-015-0031-1.

[142] Barbara A. Schillo, "JUUL in School: Teacher and Administrator Awareness and Policies of E-Cigarettes and JUUL in U.S. Middle and High Schools," *Health Promotion Practice* 21(1, 2020): 20-24, DOI: 10.1177/1524839919868222.

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According to the CDC, including only factual information on the harmful effects and/or consequences of cigarette use is not only ineffective in preventing youth from using cigarettes but may stimulate curiosity about cigarette use and may prompt some students to believe that the harmful health effects of cigarette use are being exaggerated by adults. According to the CDC, successful programs to prevent cigarette use address multiple psychosocial factors related to cigarette use among children and adolescents such as:

- Short- and long-term negative physiological, cosmetic, and social consequences.

- Social norms regarding cigarette use.

- Social influences that promote cigarette use.

- Peer norms regarding cigarette use.

- Behavioral skills for resisting social influences that promote cigarette use.

The CDC suggests these programs address those psychosocial factors based on age-appropriate measures.

iii.   Education on cigarette use prevention should be provided to students from kindergarten through 12th grade, with more intensive information for junior high or middle school students and should be reinforced in high school.

While substance use generally begins during the adolescent years, there are known biological, psychological, social, and environmental factors that contribute to the risk that begin accumulating as early as the prenatal period. This creates opportunities to intervene very early in an individual's life and thereby prevent substance use disorders— and, along with them, a range of other related behavioral problems—long before they would normally manifest themselves.[143]

While e-cigarette use often begins during a student's teenage years, equivalent to middle school age (i.e., grades six through eight), intervention early in childhood can change the life course of a child in positive directions. For this reason, the CDC recommends providing educational programs on cigarette use to students from kindergarten to 12th grade, with intensive information for middle school and high school students. According to the CDC, the first year of middle or high school is particularly important because it is when the new junior students are exposed to older students. Annual prevention education should also be provided to high school students to reinforce the effort. The CDC suggests that cigarette use prevention programs be integrated as a part of school health programs.

iv.   Schools should provide program-specific training for teachers.

Properly trained teachers using a quality curriculum will improve program effectiveness because the implementation of the program will be more consistent. It is important that teachers receive training to better understand the importance of careful and complete implementation of the chosen programs.

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[143] National Institute on Drug Abuse, "Principles of Substance Abuse Prevention for Early Childhood: A Research-Based Guide," 2016, 3, https://www.drugabuse.gov/sites/default/files/early_childhood_prevention_march_2016.pdf.

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Training which provides a clear understanding of the theories and conceptual framework and content of the program can also help teachers deliver the information with greater consistency. A review of the content in the program combined with a modeling of program activities by trainers will also improve the program implementation. Including activities which afford teachers opportunities to practice implementing program activities will also increase program quality. In-person training and review of curriculum-specific activities have also been found to increase compliance with program components.

> v.   Schools should involve parents or families in support of school-based programs to prevent tobacco use.

Involving parents, guardians or caregivers can provide important environmental and social support for smoking cessation. Schools can play and important part by including parents and guardians in program planning, increasing community support for programs, and to increasing the level of reinforcement of program messages in the student's home environment. As an example, parents or guardians' involvement in homework assignments will increase the chances that smoking is discussed at home and can help adult smokers to consider cessation which can in turn help students who are trying to stop smoking.

> vi.   Schools should support cessation efforts among students and all school staff who use tobacco.

Self-help resources, peer support, and community cessation programs are practices which can potentially help students quit using tobacco products. Unfortunately, these approaches are often not available within a school system or community. Even though these types of options may often be limited, efforts to support students attempting to stop using tobacco provided by schools can be helpful. This is especially the case when school policies prohibit tobacco use.

Focusing on the immediate consequences of tobacco use, identifying specific and attainable goals, and the use of student contracts which provide rewards are hallmarks of effective adolescent cessation programs. Effective programs offer social support, teach avoidance, include tools for stress management, and include skills on refusal of offers to use tobacco. In addition, it is important to provide students with opportunities to practice the skills and strategies they learn.

The ability of school officials to be able to detect and recognize student e-cigarette use is important from a treatment standpoint. Connecting cessation program participation to other approaches educators use to prevent, detect, and intervene in student e-cigarette violations will help identify students who are addicted to nicotine and increase the number of students who obtain assistance that would not otherwise choose to find and participate in a cessation program. The CDC has determined that cessation programs using a combination of behavioral approaches such as individual counseling, skills training, and family interventions and which can be supplemented with pharmacologic treatments, have demonstrated effectiveness.[144]

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[144] Again, I understand that other experts in this litigation with specialized expertise in youth tobacco use prevention and treatment are recommending strategies to address and reduce student e-cigarette use in SFUSD and that their recommendations are consistent with the general framework for tobacco use prevention established by public health authorities like the CDC. As it relates to the specifics of issues such as prevention

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Based on the CDC's findings about cessation programs for combustible tobacco addiction, making evidence-based e-cigarette cessation programs available to students at no cost to their parents is an important component of the comprehensive and multi-disciplinary prevention and intervention strategy I recommend for SFUSD. The determination of which specific program(s) should be implemented in SFUSD should be made by qualified experts in the field of nicotine addiction.

> vii.   Schools should assess the cigarette-use prevention program at regular intervals.

The following evaluation questions can help school officials determine whether their programs are consistent with the CDC's Guidelines for School Health Programs to Prevent Tobacco Use and Addiction. The CDC also notes that others such as personnel in federal, state, and local education and health agencies also can use these questions to evaluate whether or not schools offer effective education to help prevent tobacco use and can help them identify schools that would benefit from additional training, resources, or technical assistance. These questions can be helpful for school officials to re-evaluate their cigarette-use prevention programs at regular intervals as recommended by the CDC. The CDC provides questions which can be used to help assess the effectiveness of school's efforts in this area:

- Do schools have a comprehensive policy on tobacco use, and is it implemented and enforced as written?

- Does the tobacco education program foster the necessary knowledge, attitudes, and skills to prevent tobacco use?

- Is education to prevent tobacco use provided, as planned, in kindergarten through 12th grade, with special emphasis during junior high or middle school?

- Is in-service training provided, as planned, for educators responsible for implementing tobacco-use prevention?

- Are parents or families, teachers, students, school health personnel, school administrators, and appropriate community representatives involved in planning, implementing, and assessing programs and policies to prevent tobacco use?

- Does the tobacco-use prevention program encourage and support cessation efforts by students and all school staff who use tobacco?

> b.   *A combination of various technology-based measures to improve student supervision, limit spaces favorable for e-cigarette use, and detect students vaping.*

As discussed above, the 2020 NYTS survey found 43.5% of students responded that "A friend used them" as a reason for them using e-cigarettes. Because students spend much of their waking time at school, it is reasonable to conclude that "a friend used them" describes students seeing, witnessing, or being aware of one or more friends using e-cigarettes at school. In other words, it is reasonable to

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education and counseling and cessations strategies, and the associated costs, I will defer to the recommendations of these experts.

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conclude that the 2020 NYTS survey indicates that many of the 43.5% of students considered the prevalence of e-cigarette use at school as the driving factor for their use of e-cigarettes.

The 2019 and 2020 NYTS surveys also showed the ability to do tricks with e-cigarette products (21.2% and 19.4%, respectively) and to use e-cigarettes at home or at school without being detected (13.9% and 11.7%, respectively) as among the key driving factors. This data supports the need to make it more difficult for students to regularly use e-cigarettes at school, not only to address the many problems such use causes for K12 school districts, but also to help reduce the problems with addiction of school-aged youth which have negative impacts in the school and broader community. I have found this to be true with other pervasive societal problems such as off-campus violence and gang activity involving school aged youth, and my experience is that the same positive benefits from school system e-cigarette use prevention and intervention efforts can be seen at the community level. Stated another way, more effective prevention and intervention efforts by school officials can help reduce problems with youth addiction beyond the schoolhouse.

I find that to successfully address these driving factors, SFUSD will need to implement additional and more effective measures beyond what has been put into place for school policies and educational programs. Based on the results of their survey of 22,318 high school students, 81 senior school administrators from 81 randomly selected schools in Canada, Lovato et al. concluded that a school tobacco control policy alone did not have direct and consistent effects on school smoking prevalence, and students' perceptions of policy enforcement were moderately associated with smoking prevalence.[145] The study by Schillo et al. demonstrated that as to vaping, the stealthy nature of e-cigarettes makes it difficult for schools to enforce e-cigarette control policies. I find that this study, the other documents I have reviewed, and my experience with student substance abuse confirms that prevention approaches based only on school policies, punitive measures for violations, improved student supervision of students and educational programs are not adequate to address the prevalence of e-cigarette use at school without substantial additional supporting measures as detailed in this section of my report.

In essence, the prevalence of e-cigarette use and the students' ability to do tricks with e-cigarettes as well as to use the products at school with a lower chance of being caught are due to the stealthy nature of e-cigarettes and the ability of students to find locations where they are not being supervised by school staff to vape. Therefore, I find that in order for SFUSD school officials to be able to successfully address the key factors of e-cigarette use, in addition to school policies and educational programs, the District will need measures that can help them more effectively detect students' vaping activities, supervise students, and limit unsupervised spaces where students can engage in e-cigarette use. In my experience, these goals can be achieved by SFUSD practices augmented by a proper technology array. Technology can be defined as devices (such as machines, computer software, applications, equipment, etc.) designed, developed, and implemented to serve some purpose; therefore, school safety technology can be considered as the devices designed, developed, and implemented to enhance the safety of school populations and the protection of property. When included as part of a comprehensive

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[145] Chris Y. Lovato et al., "The Impact of School Smoking Policies and Student Perceptions of Enforcement on School Smoking Prevalence and Location of Smoking," *Health Education Research 22*(6), 2007: 782-793, https://doi.org/10.1093/her/cyl102.

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strategy and used properly, technologies do aid in the improvement of school safety. One limitation of the research on the effectiveness of school safety technologies is that most of the technologies are reliant upon human decision-making and, in many instances, work more effectively when utilized in concert with other technologies.

After reviewing available technology-based and detection measures in school safety, I recommend the use of the following technology-based measures as a supplement to other components to create and sustain a practical, comprehensive, multi-disciplinary strategy to enable SFUSD to effectively prevent and address the student use of e-cigarettes at school:

1. An e-hall-pass system to improve student supervision to deter, detect, and investigate instances of students using e-cigarettes at schools.

2. Vape sensors to detect students using e-cigarettes at schools.

3. Smart camera systems with robust analytic software programs to improve student supervision and more efficiently investigate and intervene in instances of students using e-cigarettes at school.

4. Access control systems for exterior doors as well as for large difficult-to-supervise areas such as locker rooms, auditoriums, and stages.

5. Nicotine and THC detection swabs to promptly test and detect residue of nicotine and THC to more effectively and accurately investigate vape sensor alerts and other indications of student e-cigarette violations.

Based on the comprehensive assessment, I recommend the implementation of these five upgrades at all of SFUSD secondary schools, except the one that does not appear to currently have a significant issue with student e-cigarette use as noted in the Safe Havens' Assessment section of this report (Section 6).

I note that whether focused primarily on e-cigarette use detection or having multiple benefits, all of the technologies I recommend in this report have been developed by vendors in a manner that make them extremely effective in helping school officials prevent and intervene in student e-cigarette use as long as they are implemented with the other important components I recommend. The technology-based measures in this section are not to be viewed as stand-alone measures but instead should be seen as part of the comprehensive, multi-disciplinary strategies I have emphasized throughout this report. If implemented in this manner, they will enable school officials to make e-cigarette use among students the unusual exception rather than the daily rule as is the case in many secondary schools. Additionally, I note that this section provides general information on the technology-based measures I recommend that SFUSD adopt to prevent and address the epidemic of students vaping. As with other challenging problems such as weapons and gang activity that seriously impact K12 schools, the selection of specific types of technologies (such as cameras), staffing levels to support them, and related considerations must take into account the local conditions of the school and school district in order to be effective. For example, while it is common for building administrators in many regions of the country to have considerable freedom to assign teachers to help supervise students during morning arrival, class changes, lunch periods and afternoon dismissal, I have worked with many school systems that cannot utilize teachers for these types of duties due to union agreements. In fact, some school districts I have

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worked with have hired dozens or more campus monitors or security officers to perform these duties because of union agreements which do not allow teachers to be utilized for student supervision outside the classroom.

A variety of local realities and conditions, building designs, infrastructure, the level of support from local courts, safety and security staffing, existing security and communication systems, and level of e-cigarette use are just a few examples of the many factors that can affect which specific models and brands of the standard array of school safety technologies and which other specific measures are logical and effective choices for a particular school district and in some cases, for a specific school. For these reasons, my specific recommendations are based on a comprehensive assessment process to tailor the specific numbers, types and locations of technologies and other supportive components to SFUSD.

The following sections will describe in detail how these technologies will work in concert with other measures to help SFUSD effectively prevent and address the use of e-cigarettes at schools. In order to be effective, these measures should be used together to support each other, as illustrated in the following example by researchers at Johns Hopkins University:

> *A bank provides a useful, simple example. Typically, to access a bank's vault requires one to pass through multiple layers of protection. For example, after the bank closes for the day, an intruder might have to bypass a locked door and a human guard. Next, the room where the vault resides could be monitored by an infrared camera that is cued to begin recording by a motion sensor. Lastly, if the vault is opened outside office hours, an alarm system may be tripped that sends an alert to local law enforcement and sends a signal to automatically lock the doors. By mixing and matching various security technologies, schools can carry out three objectives of security, prevent, detect, and response.[146]*

> i.   <u>Utilize an e-hall-pass system to improve student supervision to deter, detect, and investigate instances of student e-cigarette use at schools.</u>

In my experience, thoughtful and systematic student supervision is one of the most effective ways to prevent and intervene in a variety of student conduct violations including e-cigarette use. Current advancements in analytic software have improved a number of school safety technologies so much that they are now highly valuable tools to enhance the live supervision of students. As detailed later in this report, I have found that these dramatic improvements in technology–such as smart cameras, analytic software, and e-hall-passes–can be used to augment live student supervision, especially for schools with limited personnel who can be assigned to supervise students at different times of the school day.

As described in detail above in the Safe Havens' Assessment (Section 6), hall-passes, are issued to a student to demonstrate permission from a teacher allowing a student to temporarily leave a class for a specific purpose (such as going to the restroom or visiting the nurse's office for their medical care) and then returning to their class. There are basically two types of hall-passes: paper-based and electronic. Traditionally, many schools in the U.S. use paper-based hall-pass systems such as:

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[146] Johns Hopkins University Applied Physics Laboratory [JHUAPL], *A Comprehensive Report on School Safety Technology*, 2016, 2-21, https://www.ojp.gov/pdffiles1/nij/grants/250274.pdf.

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- Paper hall-passes with student's name, reason the pass was granted, destination, time issued, and the name and/or signature of the issuing teacher.

- A classroom roster for students to sign out from and back into the class.

- A visually distinctive object which is issued to and must be carried by students who have been granted permission to leave a classroom by a teacher.

- Stickers that have a fadeout.

While paper-based systems have advantages (such as being easy for teachers to issue), they inherently have many weaknesses that can limit their effectiveness. The following are some examples of the weaknesses in traditional paper-based hall-pass systems:

- Some systems make it difficult to detect if a student has an appropriate hall-pass or reuses or forges a hall-pass.

- These systems do not offer an easy-to-use method to log the passes issued by different teachers, making it difficult to limit number of students in a bathroom at the same time.

- Some systems do not allow an easy way for a student to keep track of the time they are out of a class with a pass and when they should be back to the class.

- The systems do not offer a way for school staff or administrators to detect if a student has been out of the class with a pass for a long time and to identify the teachers who have a tendency to issue hall-passes easily and far more frequently than other teachers in the same school.

- The systems do not offer an easy way for teachers and administrators to identify the students who request far more hall-passes than most students in the same school and who may be at increased risk of harm.

Due to the stealthy nature of e-cigarettes, traditional hall-pass approaches are inadequate to help most middle and high schools address the problem. To be effective in their efforts to prevent student e-cigarette use at school, I find that secondary schools at SFUSD will need an e-hall-pass system that can help their personnel more effectively supervise students and make it more difficult for students to meet and vape as a group activity during instructional times. In addition to helping school personnel prevent many e-cigarette violations, this capability will also help reduce the time required for school officials to investigate vape sensor alerts. I find that the District will need a robust hall-pass system that is not unreasonably labor intensive to implement and sustain.

After review of the available hall-pass systems, I find that e-hall-pass systems can address most, if not all, of the weaknesses of traditional hall-pass systems and would help schools effectively prevent and address e-cigarette use among students in the District. E-hall-pass systems allow a student to request a hall-pass electronically via a website or an app on a computer, phone, tablet, or computer kiosk, and a teacher can easily and quickly review and approve or deny the request electronically. While there are some differences between e-hall-pass systems offered by different vendors, they typically also provide the following benefits:

- Teachers can quickly review a pass request and approve or cancel the pass.

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- Teachers, authorized staff, and administrators can set and easily enforce a limit on the number of students with approved passes in a bathroom or any other area in the school building at the same time. For example, e-hall-pass systems would allow a building administrator to establish a limit of two students being able to obtain a hall-pass to each restroom at the same time during instructional times.

- For individuals students who have a history or pattern of abusing hall-passes, teachers, hall monitors or other authorized staff, and administrators can electronically establish a limited number of hall-passes that a student can obtain for a semester or a school year.

- Students, teachers, authorized staff, and administrators can quickly check the number of passes individual students have been issued during the semester or school year to spot patterns of abuse of hall-passes.

- Administrators will also be able to easily identify teachers who tend to issue hall-passes far more frequently than other teachers in the same school.

If an e-hall-pass system is integrated and utilized with my recommended array of smart cameras and analytic software, school officials can more rapidly, reliably, and easily determine if student movement during instructional times is consistent with passes that have been issued. This combination of technologies will also make it easier for school officials to detect the areas students start to travel to without a hall-pass for e-cigarette use. For example, the combination of technologies will allow school officials to detect the students who learn that there are unoccupied rooms that cannot be locked for safety reasons and begin using those rooms to vape. The use of these combined technologies will make it highly unlikely that students will be able to regularly utilize such a location to vape on a regular basis because they will likely be caught as they attempt to travel to and from the location while out of class with a hall-pass. In addition, once an area is identified as a problem location, school officials can take action to prevent vaping in the location by placing portable vape sensors and/or smart cameras or using other measures to dissuade students from using the location to vape.

The combination of technologies as part of the comprehensive, multi-disciplinary strategy can enable school personnel to prevent and detect e-cigarette violations more effectively than is possible with other measures currently in use at some schools while affording increased ability for students to use the restroom, visit a school nurse, visit a school counselor, etc. Put another way, this combination of technologies will provide greater freedom to students. This approach avoids the measures commonly employed in some schools and school districts to place severe restrictions on all students due to e-cigarette use by some students because they did not utilize a more effective approach.

As detailed in Safe Havens' Assessment (Section 6), one of 31 secondary schools in SFUSD has an e-hall-pass system that is extremely limited and does not offer most of the features listed above for a robust and user-friendly e-hall-pass system. Therefore, I find that SFUSD will need to equip its secondary schools with a more robust e-hall-pass system that offers most or all of the above feature to be included in the comprehensive, multi-disciplinary strategy to enable the District to effectively prevent and intervene with students using e-cigarettes at schools. I note that the cost of these systems is relatively modest and, in some cases, can be utilized without cost.

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Based on a review of the currently available e-hall-pass technologies, there are many systems available on the market that could meet the needs that I recommend. For instance, the myHomework hall-pass system[147] offers all of the features listed above for a robust e-hall-pass system and is among the most widely used e-hall-pass systems for K12 schools. The myHomework hall-pass system is an app-based program that can be relatively inexpensive depending on how the District might choose to utilize the system.

Additionally, since most e-hall-pass systems do not include physical visual hall-passes as a second layer to make it easier for staff to detect violations, I recommend the use of visible hall-passes to augment the e-hall-pass systems in schools. I recommend SFUSD equip each classroom with five plastic uniquely numbered visible hall-pass cards to be issued to and returned by students each time they are provided a hall-pass. In addition to providing an additional means for school staff to spot students who are out of class without authorization, this approach will help limit the number of students who can be out of a particular classroom at one time.

As with traditional paper-based hall-pass approaches, there is a potential for students to try to use lost, stolen, or forged plastic hall-passes. For this reason, I recommend that the plastic hall-pass cards have the issuing classroom number and school logo printed in a large enough size to be recognizable by staff at a distance of six to eight feet. I also recommend the cards be worn on a breakaway lanyard. This type of lanyard is designed to break under pressure to prevent accidental choking (such as a lanyard being caught in a machine with moving parts) or intentional choking (such as a student who tries to use a lanyard to choke another student).

In addition, the use of specific lanyard colors that match the hallway of the student's classroom can make it even more difficult for a student to use a lost or stolen hall-pass without detection. For example, use a light blue lanyard for classrooms on the 100-hallway, a black lanyard for the 200-hallway and a white lanyard on the 300-hallway (color deficient individuals often have difficulty discerning red, yellow and green). These pass cards and color-coded lanyards would allow school staff to visually and electronically (i.e., via a camera system) detect if a student has travelled to areas they not approved to go to. For example, if a student was observed in a hallway on the video management system by a staff member, or by a staff member who encounters a student in person, the staff member can quickly look at the hall-pass system to determine if that student has an authorized hall-pass for the student's location.

This approach offers redundant visual and electronic opportunities for staff to detect students who are out of place, abuse a hall-pass by attempting to travel to a hard to supervise area where the hall-pass is not valid, or who attempt to use forged, lost, or stolen hall-pass cards. This approach will make it extremely difficult for students to regularly get to and from hard to supervise areas. The use of e-hall-passes combined with "No Go" zones, staff development efforts to increase awareness, improved student supervision efforts, a smart camera system, video analytics and vape sensors will be significantly more effective than any one or two of these approaches in isolation.

In my experience, even in school districts which have personnel dedicated to monitoring school security cameras, it is not possible for humans to spot every anomaly. Therefore, a combination of an e-hall-pass
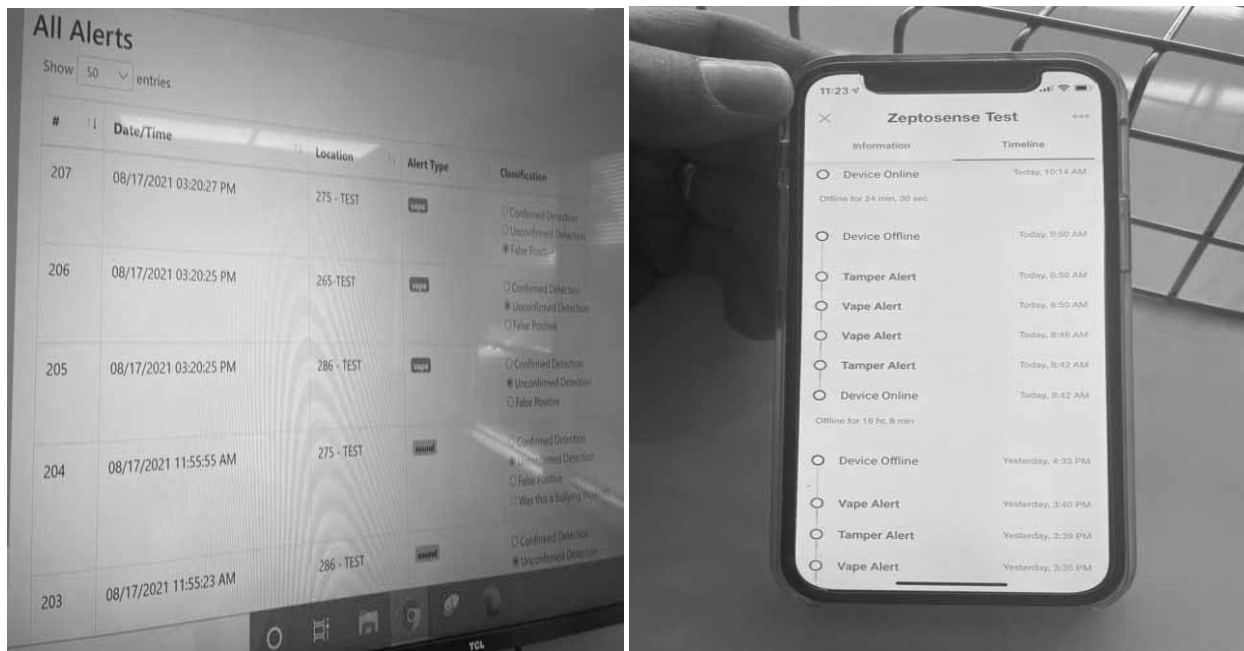
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[147] https://schools.myhomeworkapp.com/

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system, color coded hall-passes and lanyards, vape detection sensors, smart cameras, and video analytics, as described in this report, will dramatically improve the ability of SFUSD school personnel to prevent student e-cigarette use by detecting the students who are attempting to find a private area to vape before they are able to do so or, if that effort fails, to identify them as they attempt to return to class or other activities after using e-cigarettes.

ii.   Utilize vape sensors to detect student e-cigarette use at schools.

As noted above in the Safe Havens' Assessment, there are specialized sensor devices which resemble smoke or carbon monoxide sensors can detect e-cigarette use, referred to as "vape detectors." I find that vape sensors will help address the difficulties school officials have encountered in trying to visually detect e-cigarette use through live, in-person student supervision. I find that current models of vape sensors are highly reliable and accurate. I personally met with representatives from the leading vape sensor manufacturers (IPVideo Corp., Soter Technologies, and Zeptive) to confirm the functionality of these devices and ensure that they can be effectively deployed in the manner recommended in this report. According to the representatives from all three of the leading vape sensor manufacturers, the vape sensors are very sensitive to vapor aerosols, and they have developed features to determine causes of potential false alerts and to adjust individual sensors to maintain a high degree of detection reliability while making false alerts rare. The manufacturer can also track the status and false alarm rate for every vape sensor.

Photos by Michael Dorn

Manufacturers of the devices have also addressed concerns that students might tamper with or spray substances into the devices by adding features such as hardened housings and tamper alarms which can set off an audible alarm and send an instant notification to school personnel. When combined with appropriate types of camera footage and an e-hall-pass system, rapid identification of students who attempt to damage vape sensors will be easy and reliable.

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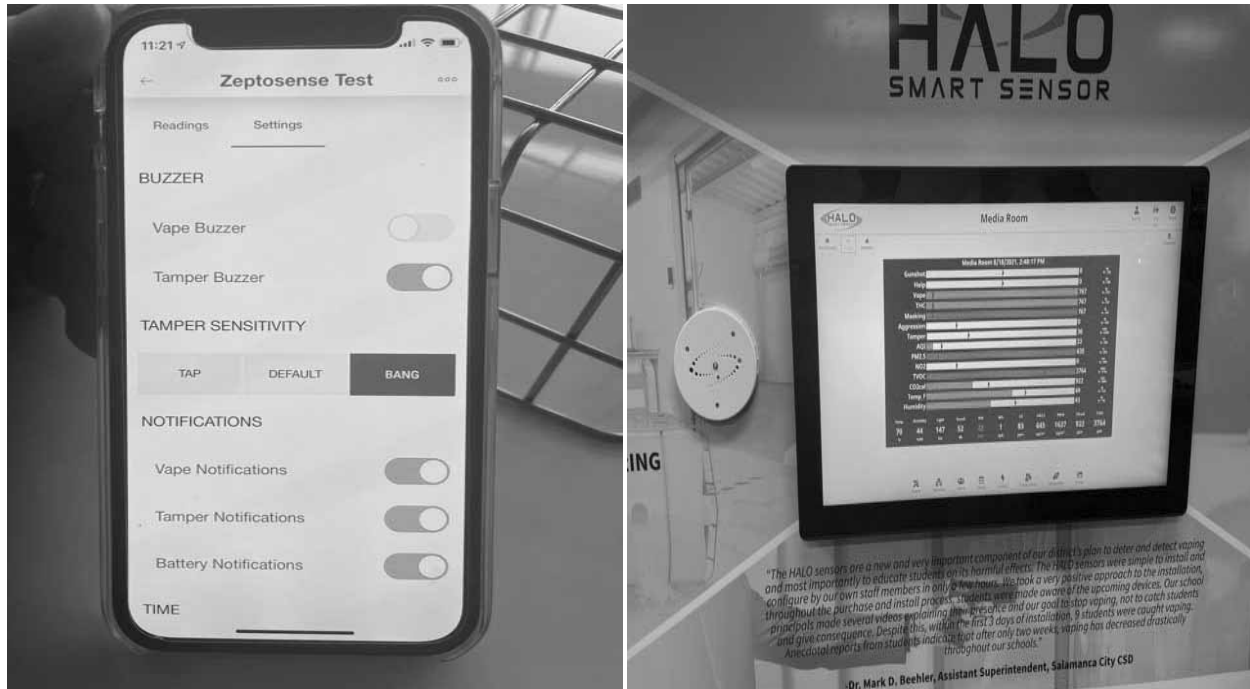*San Francisco Unified School District v. JUUL Labs, Inc. et al.*

Photo by Michael Dorn

Vape sensors can be deployed for areas where it is difficult to supervise students via live personnel and/or in locations where cameras cannot be utilized (such as student restrooms, locker rooms, greenrooms/dressing rooms in stage areas, alcoves, stairwells, etc.), and for areas where students can still quickly and surreptitiously use e-cigarettes without being caught even though an adult is present (such as classrooms). Vape sensors currently available on the market can send a notification to school administrators or other school personnel designated to receive notifications when the sensors detect vaping in a covered area. This feature provides rapid notifications which, if supported by a robust e-hall-pass system and smart cameras with appropriate analytic software and other supportive measures I recommend, will make it extremely difficult for a student to regularly use e-cigarettes without detection. I find that current vape sensors are practical, reliable, and effective tools, which will be necessary for the District to effectively prevent, detect, and intervene in student e-cigarette use at schools.

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Photo by Michael Dorn

Though the cost of a proper array of vape sensor units is still beyond the fiscal resources for the majority of school districts I have worked with over the years, an increasing number of school districts around the United States have installed vape sensors at their secondary schools. For example, hundreds of schools and school districts in New Jersey, Ohio, Illinois, and Connecticut have requested funding for or have installed vape sensors in student bathrooms at their middle and high schools.[148] However, many school districts lack funding for even a limited number of vape detectors, and few school districts can afford to deploy the number of vape detectors required to properly address the e-cigarette epidemic in a sufficiently comprehensive way.

As detailed in Safe Havens' Assessment (Section 6), no SFUSD school has any vape sensors installed as the District has not had an adequate budget to purchase the number of vape sensors that would be required to effectively address the issue of students vaping. Based on my work with hundreds of school districts in California and other states, I find that the budget required for an adequate array of vape sensors is beyond the fiscal resources of SFUSD without affecting the ability of the District to achieve its

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[148] Leah Asmelash, "High Schools Embrace 'Vape Detectors' in Fight Against Bathroom Vaping, *CNN* (2019), https://www.cnn.com/2019/09/12/health/vaping-detectors-school-trnd/index.html; Mack DeGeurin, "With Teen Vaping at all Time High, Schools are Turing to 'Vape Detectors' to Snuff out Secret Smokers," *Insider* (2019), https://www.insider.com/schools-are-turning-to-vape-detectors-snuff-out-bathroom-smokers-2019-9.

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primary goal of educating students. I find that SFUSD will need a large number of vape sensors to address the patterns of student e-cigarette use in the District.

As discussed above, administrators at SFUSD secondary schools reported that students vape in various areas on the school grounds. Based on the assessment of this District and my review of national data on where students use e-cigarettes, I recommend the installation of vape sensors for the areas in school buildings that are prone to students vaping such as student restrooms (including restrooms in locker rooms), classrooms, stairwells, greenrooms/dressing rooms in stage areas, locker rooms, libraries or media rooms, and alcoves. In my experience, installing vape sensors in the most predominant e-cigarette use locations will result in students attempting to move to other areas in SFUSD schools to vape. For this reason, to effectively prevent and address students vaping at schools, vape sensors should be used in the various areas of the District's schools where vape sensors will work reliably and effectively.

As discussed below, wherever possible and appropriate, vape sensors should be used with smart cameras with analytic software. For example, areas such as classrooms and stairwells should have both vape sensors and smart cameras. However, areas with privacy concerns for cameras such as student restrooms and locker rooms will have vape sensors only. As noted earlier, a robust hall-pass system will further increase the effectiveness of the vape sensors, smart cameras, and analytic software. This use of multiple technologies in concert with each other is consistent with leading practices in the field of school safety technology.

I do not, however, recommend installing vape sensors in certain areas on school grounds. Currently available vape sensors are less effective in large common areas with considerable air flow due to challenges in pinpointing where vaping occurred. There are also areas where vape sensors would not work as effectively without significantly increased cost, making it impractical to use fixed mounted vape sensors to protect those types of areas. Common examples of these types of areas include but are not limited to:

- Most hallways and large common areas: While vape sensors would be helpful in detecting students who use e-cigarettes in hallways when there are few people moving in the hallway, representatives from all three vape sensor manufacturers reported that their vape sensors would be less effective in crowded hallways and large common areas with large numbers of students moving at the same time.

- Cafeterias: While vape sensors would be helpful in detecting students who use e-cigarettes in this area when there are few students present, all three manufacturers also reported that the devices would be less effective when that area is crowded with large numbers of students moving at the same time. However, this area could be monitored with the wireless, battery-operated vape sensors installed under tables. In my experience, this approach would not be viable in many schools with large cafeterias because of the common practice of moving tables for cleaning on a regular basis, and the staff time required for periodically changing a large number of batteries.

  Instead, I find that a more practical alternative strategy is to utilize a combination of smart cameras with analytic software, periodic use of a limited number of battery-operated and

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wireless vape sensors placed under cafeteria tables, structured student supervision, anonymous tip reporting mechanisms, and a robust e-hall-pass system. In my experience, this approach will provide a reasonable level of protection consistent with my goal of developing an e-cigarette use prevention and intervention strategy that will make it extremely unlikely that a student will be able to use e-cigarettes repeatedly without detection.

- Main areas in auditoriums: Similar to cafeterias, vape sensors are less effective in auditoriums. While it is possible to install wireless, battery operated vape sensors under the seats, in my experience, this approach would not be practical for schools with large auditoriums because the quantity of vape sensors needed for reliable coverage would be too high. A more practical alternative strategy is the utilization of a combination of smart cameras with analytic software, periodic use of a limited number of battery-operated and wireless vape sensors, structured student supervision, anonymous tip reporting mechanisms, and e-hall-passes.

- Outdoor areas (such as walkways, porches, etc.): Representatives of all three vape sensor manufacturers reported that their devices would not be effective for outdoor areas due to the lack of a stable environment for air measurement.

The use of a comprehensive array of vape sensors in the most commonly reported areas for student e-cigarette use as well as for other difficult to supervise spaces combined with the other technologies, policies, practices, awareness and cessation efforts I recommend in this report will help SFUSD personnel significantly reduce the frequency of vaping on its secondary campuses.

For the areas that I do not recommend installing vape sensors, I recommend that smart cameras with analytic software, a robust e-hall-pass system, No Go zones, and other measures I recommend in this report, combined with spot checks using portable Zeptive vape sensors (where practical) be used. This array will allow SFUSD personnel to focus the limited staff available for student supervision on these areas by significantly reducing the effort required to supervise students in the overall space of each secondary school to a degree that in my experience will make it difficult for students to regularly vape without detection. While in an ideal world, the entire interior space of each secondary SFUSD school would be protected by vape sensors, I find that the current technology does not make this feasible.

I also recommend a pool of battery operated and wireless Zeptive vape sensors for future areas of concern caused by displacement, for random supervision of spaces where installing a proper array of sensors is not warranted and/or practical, and for the temporary replacement of any broken vape sensors while they are being repaired. For example, having a pool of easy to install, wireless and battery operated vape sensors will allow school officials to periodically place vape sensors under some cafeteria tables to spot check for e-cigarette use during lunch periods. This type of temporary installation will also help school personnel respond to tips or other indications that students at a particular table have been vaping during lunch. I note that these vape sensors can be used in a horizontal fashion like other vape sensors but can also be mounted vertically providing more flexibility for some of these applications. Based on my assessment and my experience, I recommend an average of five Zeptive vape sensors for each of the 28 schools recommended for technology-based measures, for a total of 140 sensors for the pool for SFUSD.

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> iii.   Utilize smart camera systems with robust analytic software programs to improve student supervision and more efficiently investigate and intervene in instances of student e-cigarette use at school.

According to the School Survey on Crime and Safety (SSOCS) conducted by the National Center for Education Statistics for the 2017-18 school year, 83% of public schools in the U.S. use cameras, with a higher percentage for middle schools (91.5%) and high schools (93.6%).[149] This survey and a study by researchers at Johns Hopkins University in 2016, showed that cameras were the second most commonly used technology in public schools.[150] Depending on how they are used, deployed, and integrated with other security systems, camera systems can be very valuable to school safety. For example, when schools assign staff to watch camera video feed as it is transmitted to a monitor (referred to as monitored cameras), staff can sometimes promptly observe a concerning behavior and take immediate action. But when video feed is observed only occasionally (referred to as unmonitored cameras) because a school does not have funding for dedicated personnel to monitor them, traditional cameras will have much more limited value in incident prevention and real-time response. In my experience, unmonitored cameras have value in deterring concerning behaviors but have typically not been as effective as some may presume. Unmonitored cameras are often used to investigate an event that has already occurred and after it has been reported.

Based on video camera signals and the method of delivering video signals, there are currently two basic types of cameras: (1) analog cameras, which send video signal via coax cables to a digital video recorder (DVR) which converts the video signal into a format that can be received by equipment such as televisions (TVs), video cassette recorders (VCRs), or monitors; and (2) digital or Internet Protocol (IP) cameras, which capture and convert video signals into a digital format inside the cameras, and video footage can be transported over a network and stored in a DVR or a memory card such as storage disks (SD cards). As detailed later in this section, due to the features, quality of captured images, and capabilities of IP cameras, I recommend this type of camera for use as part of the comprehensive strategy to prevent and intervene in student e-cigarette use at schools.

There are also many other distinctive features among various types of analog and IP cameras, such as differences in image quality, recording methods, scalability, etc., but an important difference is the ability to utilize video analytics, a type of software that can rapidly read and analyze digital video streams. Since analog cameras need to send video signal via coax cables to a DVR to convert the signals into a digital format, the quality of the converted signals and the speed of the conversion are compromised and not suitable for video analytics. In contrast, since IP cameras convert video data into a digital format inside the cameras, video analytic software can work with IP cameras with high quality and reliability.

Video analytics were developed to enable more efficient video analysis in comparison to time consuming and less accurate manual analysis of video data, particularly for situations where there is a

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[149] National Center for Education Statistics [NCES], *School Safety and Security Measures*, n.d., https://nces.ed.gov/fastfacts/display.asp?id=334.
[150] Johns Hopkins University Applied Physics Laboratory [JHUAPL], *A Comprehensive Report on School Safety Technology*, 2016, 2-21, https://www.ojp.gov/pdffiles1/nij/grants/250274.pdf; NCES, n.d.

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large quantity of data to be reviewed. Video analytics can be embedded in cameras or integrated into a video management system (VMS) to analyze and identify events or potential behaviors of concern through the analysis of video streams. The IP cameras with embedded video analytics capable of capturing images, extracting specific information from the captured images, generating event or behavior descriptions, and making decisions are often referred to as "smart cameras." Some smart cameras are also marketed as motion-sensing devices. These smart cameras use image processing to detect what is happening in an image and analyze the actions of people in the image. Therefore, many of the limitations of traditional cameras for prevention and real-time detection of problem behaviors have been successfully addressed through the use of smart cameras paired with modern analytic software to detect anomalies and promptly alert authorized school personnel.

I find that smart cameras will help to significantly improve the ability of school personnel to supervise students and prevent e-cigarette use and to more rapidly and accurately investigate e-cigarette alerts from vape sensors, student tips, and other detection methods. Smart cameras also offer greater real-time response capabilities as well as reducing the time it takes to investigate an incident. For example, if a vape sensor alters in a student restroom because three students share an e-cigarette, smart cameras at the entrance of the restroom enable school officials to rapidly determine who entered the restroom prior to the alert, who departed the restroom after the alert, and where each student went after leaving the restroom. Using a feature which can track individual people through a building by selecting an object like a red shirt, blue tennis shoes, or black pants, the cameras can also help administrators rapidly determine where each student travelled to, as compared to the significant time required if using a traditional camera system.

Smart cameras with relevant and reliable analytic software have proven to be extremely helpful to school officials in multiple school districts and schools I have worked with in recent years.   Based on my research and experience, I conclude that multiple companies offer very reliable smart cameras and analytic software that is of great value in helping school officials prevent and intervene in e-cigarette use. I am confident that using smart cameras with analytic software in combination with policies, practices, e-hall-pass systems, vape sensors, and other strategies described in this report will make it extremely difficult for students to regularly use e-cigarettes in schools.

Among the many analytic software programs that can be used in the school safety and security industry, I find the following to be the most useful and practical in helping school personnel detect and prevent e-cigarette use by students:

- **Loitering detection analytics:** Detecting individuals or objects presenting, or loitering, in a designated area, or region of interest (ROI), beyond an established amount of time. Since students who want to smoke, vape, use drugs, or conduct other illicit behaviors tend to loiter or gather at a hidden area at the school for the activities, loitering detection analytics, sometimes referred to as dwell time detection, can be used to detect the risk of loitering and prevent it before students can conduct those concerning activities. For example, a school system could set the loitering detection parameters at 30 seconds, 60 seconds or any set period of time based on policy and practice. If three students stopped and engaged in e-cigarette use in an ROI for 30 seconds and the parameter was set at 30 seconds, the system would send an automatic alert to designated personnel. The official could then quickly pull up a real time feed for the camera(s)

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sending out alerts and review the previous footage as well as the live feed to determine if there is a problem or not.

- **Object analytics:** Detecting and locating a specific person or object. This type of analytics can help school personnel identify a certain student associated with an event which has just occurred. For example, when a vape sensor in a restroom goes off and notifies school personnel, and the staff who monitors the camera sees that a student in blue jeans and red shirt exited the restroom right after the sensor went off, the staff can use the object analytic feature to identify the location of the person wearing those clothes. This will help school personnel identify the student who might have vaped in the restroom.

- **Perimeter analytics:** Detecting a person or object crossing a demarcation point, such as a fence or property line. My experience has been that students also often go to school grounds after hours to conduct illicit activities such as smoking and vaping. I also have noted that students sometimes arrive at school late, depart school early, or leave campus and then return to engage in misconduct such as vaping. Perimeter analytics can help detect these types of behaviors and intervene to prevent those illicit activities from occurring. In addition to detecting unauthorized individuals passing through a protected zone, perimeter analytics can detect the specific behaviors associated with climbing a fence.

- **Zone intrusion analytics:** Detecting an individual passing into designated zones or areas during a certain time. This type of software can be used to detect unauthorized individuals entering off-limit areas or prohibited areas, or "No-Go" zones. In e-cigarette use prevention, schools can use this type of analytics for zoned areas such as stairwells, auditoriums, locker rooms, stage areas, alcoves, rooftop access points, hallways, and certain entrances during specific time periods – these are the areas students tend to vape at when they cannot vape in student restrooms. The use of "No-Go" zones, live supervision practices, e-hall-pass systems, and smart cameras with zone-intrusion analytics can create significant challenges for students who attempt to get to difficult-to-supervise outdoor areas on campus or to leave campus to engage in vaping. As with other approaches I describe in this report, while not foolproof, the combination of approaches described will make it much harder for students to repeatedly move through "No-Go" zones to engage in e-cigarette use in difficult to supervise locations.

- **Tracking analytics:** This type of analytic could help school staff determine where undetected e-cigarette use locations are based on anomalies in movement of groups of students to and from hard to supervise locations as well as gatherings of groups of students in these types of areas. Tracking analytics can be used inside and outside school buildings. Tracking analytics include:

  o Counting analytics which identify and quantify the number of individuals or objects passing across a designated line or threshold in a specific direction. In e-cigarette use prevention, schools can use this type of analytic to identify foot traffic at certain areas at the school to see if there are students gathering to vape.

  o Heat mapping analytics which identify and quantify individuals or objects passing a specific point and loitering in ROI.

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The use of these five specific types of analytics can help school personnel identify in real-time the areas and specific times students gather to vape and sometimes detect medical emergencies resulting from e-cigarette use. In addition to real-time detection capability, the data they produce can be used to compare to recorded camera feed to help school officials identify locations where students gather to use e-cigarettes. The use of analytic software will also improve the ability of school personnel to monitor student conduct and safety in many locations where students are allowed to congregate as well as in difficult to supervise areas. Since none of SFUSD secondary schools are equipped with smart cameras with analytic software that will provide the level of supervision required to address student e-cigarette problems, as detailed in Safe Havens' Assessment (Section 6), I recommend the use of these five types of analytics to increase the capacity of the current camera system at SFUSD secondary schools as part of the comprehensive, multi-disciplinary strategy to prevent and address students vaping at the District's secondary schools.

Different types of cameras are often installed in various areas of schools in concert with other technologies depending on the goals of school officials relative to the student supervision, safety, and security concerns that school districts need to address. For example, in combination with a visitor management system, schools often install cameras at the main entrance so staff can see and hear a visitor before remotely unlocking exterior doors to admit them into the building. As for the use of smart cameras and analytic software as part of a comprehensive, multi-disciplinary strategy to prevent and address students vaping at schools, I recommend the use of these technologies in all the areas that have frequent student footprint when appropriate and practical, as follows:

- **At the entrances of student restrooms and locker rooms:** I recommend the installation of 360-degree ("360") or dome smart cameras with analytics such as object analytics, loitering detection analytics, and tracking analytics at the entrances of student restrooms and locker rooms. While student restrooms and locker rooms are typically popular places for vaping activities, due to privacy concerns, cameras cannot be installed inside these rooms but can be installed at the entrances of those areas. I note that these types of cameras are often needed even when a restroom or locker room entrance is covered by a hallway camera because cameras designed to provide hallway coverage typically do not provide for reliable identification of students entering and leaving restrooms. Additionally, due to safety concerns, existing cameras cannot be modified or redeployed to cover these entrances. I also recommend the use of vape sensors inside student restrooms and locker rooms, as detailed earlier in this report.

- **In classrooms:** I recommend the installation of 360 cameras with zone intrusion and tracking analytics in classrooms. Typically mounted on ceilings in the center of a classroom, 360 cameras use multiple lenses to provide 360-degree overhead coverage of the area where the cameras are installed. The combination of 360 cameras and vape sensors, as detailed earlier in this report, in classrooms will allow school personnel to effectively determine which student(s) triggered classroom vape sensors more accurately, easily, and with less disruption.

   While there may be some privacy concerns from students, parents, and teachers regarding the concept of installing cameras in classrooms, the classroom camera arrays I recommend will provide a great deal of flexibility to address most of these concerns. For example, while classroom cameras can be set to record movement at all times in a classroom, this type of setup

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is not required to address e-cigarette use in classrooms. If this setup creates privacy concerns, the cameras can be programmed to automatically write over captured footage periodically (such as every 90 seconds) and would save only the footage for a set time frame (such as 45 seconds) before and after a vape sensor is triggered in a specific classroom. The reason for this approach to programming is that there can sometimes be a delay from the time a student uses an e-cigarette and the time it takes for the particles to reach and trigger the nearest vape sensor. This makes it necessary for authorized District personnel to be able to view the recorded camera footage for a brief time period prior to and after the vape sensor is triggered. For example, if a vape sensor in a particular classroom is triggered at 9:36:30 A.M., and the camera in the classroom is configured to save the only the footage 45 seconds prior to and 45 seconds after the vape sensor is activated, then only the footage from 9:35:45 A.M. to 9:37:15 A.M will be recorded.

Another option is to only activate the cameras in the classrooms in which vape sensors have been triggered to indicate that one or more e-cigarette violations have occurred. This approach will dramatically reduce the number of students who are filmed while also allowing a reasonable way to prevent repeated e-cigarette use in classrooms. These configuration options provide school districts with flexibility to address privacy concerns or to use cameras and vape sensors in the manner they see fit. For example, a school district could start with the first option for all classrooms at their secondary schools and then move to the second or third option if and as desired. The district could also move between options for some or all classrooms if and as there are indications of an increase or decrease in students vaping in the classrooms.

- **In stairwell and alcove areas:** I recommend the installation of dome smart cameras with object search, loitering detection, and tracking analytics for stairwell and alcove areas. As detailed earlier in this report, I also recommend the use of vape sensors for these areas. The use of smart cameras with analytic software and vape sensors for these areas are particularly important as these areas are often hidden and hard to supervise areas, thus often prone to students vaping. The capabilities of smart cameras with analytic software and vape sensors allow school personnel to effectively detect students gathering in those areas and vaping during class times and other times when large numbers of students are not moving in stairwells.

- **In auditoriums:** I recommend the installation of 360 or low-light dome smart cameras with object search, zone intrusion, and tracking analytics in auditoriums. Just as other hidden and hard to supervise areas, the use of smart cameras and analytic software for auditoriums is particularly important to improve supervision for these areas. In my experience, this is an area that should be covered with cameras even if incidents of student e-cigarette use have not been previously reported. First, this is an area where it is difficult for staff to detect vaping violations. Second, this is an area where students are likely to relocate for e-cigarette use if vape detectors and/or smart cameras with analytic software are added to other areas they previously vaped.

- **In main hallways:** I recommend the installation of dome smart cameras with object search, loitering detection, zone intrusion, and tracking analytics for main hallways. As with other open space areas, battery-operated wireless vape sensors from the recommended pool of devices can

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be placed in hallways if student surveys, anonymous tips, or other information indicates that students are vaping during periods of low student movement in one or more hallways.

- **In large common areas:** I recommend the installation of 360 or dome smart cameras with object search, loitering detection, zone intrusion, and tracking analytics in large common areas. As with the main hallways, I recommend the use of battery-operated wireless vape sensors from the recommended pool for large common areas as indicated.

- **In cafeterias:** I recommend the installation of 360 or dome smart cameras with object search, loitering detection, and tracking analytics in cafeterias. As with other large areas, I recommend the use of battery-operated wireless vape sensors from the recommended pool for cafeterias as indicated.

- **In media centers/libraries:** I recommend the installation of 360 or dome smart cameras with object search, zone intrusion, and tracking analytics in media centers/libraries. I also recommend the use of vape sensors, as detailed earlier in this report.

- **In outdoor areas:** I recommend the installation of Pan-Tilt-Zoom (PTZ), 360, or dome smart cameras with object search, loitering detection, perimeter, and zone intrusion analytics on the corner and center of a building's exterior to provide coverage for outdoor areas such as courtyards, playgrounds, perimeter, parking lots, etc. PTZ cameras are built with the electronic and mechanical components that allow an operator to move the camera view to the left or right, up and down, and to zoom in or out. PTZ cameras can often provide a 180- or 360-degree view depending how they are installed. PTZ cameras will allow authorized SFUSD personnel to proactively assess a specific area of interest by remotely moving the camera's field of view and focal length. PTZ cameras can also be set on a "guard tour," where it moves from one preset position to the next for a set amount of time. These guard tours can be set to scan identified vaping areas. These cameras also offer the ability to automatically zoom in on these areas and, as a result, show details that would not be possible with conventional security cameras. In my experience, PTZ cameras provide a level of detail and clarity for viewing at distances not provided by other types of cameras.

- **"Walking Only" and "No Go" zones:** Students often gather in groups in a manner that makes it possible for them to engage in inappropriate behaviors such as e-cigarette use without being easily and visually detected by supervising staff. The use of "Walking Only" zones (which are designated areas where students are allowed to move through them but are prohibited from stopping, gathering, or loitering during specific time periods) can help limit students from gathering at a location. Similarly, the use of "No Go" zones (which are designated areas where students are not allowed to pass through) can help limit students from passing through an area to get access to a hard to supervise area. To effectively manage these zones, I recommend the use of smart cameras with loitering detection and tracking analytics for "Walking Only" zones and the installation of smart cameras with perimeter, zone intrusion, and tracking analytics for "No Go" zones. Using cameras in these zones will be effective to detect and prevent students who are attempting travel to hard-to-supervise areas to use e-cigarettes. As detailed in Safe Havens' Assessment (Section 6), 24 (60%) of the 31 secondary schools in SFUSD have not

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established "Walking Only" zones, and 8 (20%) of the schools have not made use of "No Go" zones. I recommend the District identify and establish these zones where appropriate and utilize smart cameras with analytic software as described for these zones.

As detailed in Safe Havens' Assessment (Section 6), while all 31 secondary schools in SFUSD have security cameras, the quality, types, capabilities, and placement of the cameras do not provide the capabilities needed to support the type of comprehensive strategy required to enable the District to effectively prevent and address student e-cigarette use. Therefore, I recommend a smart camera system with an array of analytic software for the 28 secondary schools recommended for the technology-based measures to increase the ability of school officials to deter, detect, and investigate instances of student e-cigarette use.

Another important component of a security camera system is a VMS to enable the consolidation of the capturing, recording, storing, retrieving, viewing, and analyzing of video footage. A robust VMS solution allows the management and utilization of a camera system more effectively and efficiently as well as the integration of a camera system with other security technologies such as access control and vape detection system. Therefore, a VMS is needed to integrate cameras and other technologies as part of a comprehensive, multi-disciplinary strategy to prevent and address student e-cigarette use at schools. As detailed in Safe Havens' Assessment (Section 6), the District's current VMS is not being utilized nor maintained. Therefore, I recommend as a new VMS system for SFUSD as part of the strategy. The District will also need additional VMS infrastructure to accommodate the additional cameras and vape sensors.

iv.   Utilize access control systems for exterior doors as well as for large difficult-to-supervise areas such as locker rooms, auditoriums, and stages.

As detailed in the Safe Havens' Assessment (Section 6), based on incidents where students have been caught vaping, students have reported vaping occurs, and/or student survey data, administrators at 24 (74.42%) of the 31 secondary schools in SFUSD reported that their students have vaped in outdoor areas. In other words, outdoor areas are among the most popular locations for student e-cigarette use at SFUSD. I find that alerts indicating that a person inside the school opened an exterior door will significantly increase the ability of SFUSD school officials to effectively prevent and address student e-cigarette use in outdoor areas. These alerts would allow school personnel to verify who opened the door and for what purpose. SFUSD could benefit from the use of door position sensors (DPSs) for exterior doors to alert authorized school staff when an exterior door is opened. However, as no SFUSD secondary schools currently have an access control system for exterior doors in place, DPSs cannot be added to exterior doors at the schools without the addition of a new access control system. Without an existing access control system in place, I cannot recommend for SFUSD to install new DPSs to exterior doors.

In addition to the outdoor areas, in my experience, students also tend to vape in indoor areas that are hard for school staff to supervise, such as student locker rooms, auditoriums, and greenrooms/dressing rooms in stage areas. In fact, as detailed in Safe Havens' Assessment (Section 6), SFUSD school administrators also reported their students have vaped in those indoor areas. While I recommend the use of smart cameras and vape sensors for some of those indoor areas when it is appropriate and practical, I find that it will also significantly increase the ability of school officials to prevent student e-

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cigarette use in those areas if authorized school staff and staff monitoring cameras are alerted when the doors to those areas are unlocked. The alert will help school staff to promptly check the area, either physically or via camera, to verify if a student is trying to get access to that area for vaping. Therefore, I also recommend the use of Inovonics wireless DPSs for the doors to those areas.

I also recommend the use of a proximity card-based access control system (such as a card reader) combined with DPSs for the doors to those indoor areas (student locker rooms, auditoriums, and stage areas). With a card reader in place for those doors, authorized school staff will be able to get access to the areas, keep the areas secured when not in use, and grant students access to the areas as needed. For example, if a student asks a drama teacher who is working with students in an auditorium for a pass to go to a student restroom, the teacher can issue the student a proximity card that will allow them to re-enter the auditorium when they return. In reviewing the current available products, I recommend the use of Allegion card reader system for the doors to the indoor areas that are hard for school staff to supervise, such as student locker rooms, auditoriums, and stage areas. In addition to being competitive in price with other similar products, the Allegion system can be used as a standalone system in a school district that does not have any access control system in place such as SFUSD.

I recommend that the authorized school staff responsible for the supervision of those areas be issued five access control cards that will work with only the doors to their specific area. For example, I suggest the staff who are responsible for the supervision of the auditorium be issued with five access cards that will open the doors to the auditorium only. Five cards should be adequate to grant students access to the area as appropriate. This will help the school keep the area secured while also keeping track of which students are granted access to the area and when they departed and entered the door. It will also help provide students access to a specific area and not additional unauthorized areas. For example, if a student asks for a hall-pass to go to the locker room, the student will not be able to use the card to open other rooms such as the auditorium.

> v. Utilize nicotine and THC detection swabs to promptly test and detect residue of nicotine and THC to more effectively and accurately investigate vape sensor alerts and other indications of student e-cigarette violations.

As discussed throughout this report, it is often very difficult for school staff to detect if a student who is caught with a vaping device has actually vaped. This is important because it is not usually apparent whether an e-cigarette device contains nicotine or THC. However, the use of nicotine and THC detection swabs can help SFUSD officials address this challenge. These swabs are a field test used by some school districts and law enforcement officials to determine if particles from vaping are present on e-cigarette devices. I find that these swabs are a relatively low-cost enhancement with a minimal fiscal impact for SFUSD.

Additionally, it is common for a group of students to share an e-cigarette device in locations like restrooms. If a vape sensor sends an alert that THC has been detected in a student restroom, or if a tip is received, and multiple students are observed leaving the restroom, then THC detection swabs can be used on students' hands, face, or clothing to determine which students have vaped. This type of tests can also sometimes help to clear innocent students who, while in the area, have not vaped.

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Unlike THC detection swabs, nicotine swabs are less effective for use on a person's hands, face, or clothing to detect nicotine. Therefore, if a vape sensor alerts that nicotine has been detected in an area with a group of students gathering, I do not recommend that nicotine detection swabs be used to detect which students have vaped.

For the appropriate purpose, I do recommend the use of both nicotine and THC detection swabs as they can be of value in several ways. First, if a student is caught with a vaping device, both nicotine and THC detection swabs can be used on the device to determine if the student has recently vaped THC or nicotine or both. This will help school officials refer the student to a proper treatment and/or cessation program as appropriate. Second, if one or more students are found unconscious with one or more vaping devices nearby, the use of both THC and nicotine detection swabs on the devices can determine if the students have likely vaped THC, nicotine, or both. This can provide helpful information to those providing emergency medical assistance.

Based on my experience and review, I find SwabTek™ to be the best brand to use. According to the company, SwabTek™ swab kits have been sold to more than 500 public school systems for several years. I find that SwabTek™ offers safe and easy-to-use presumptive tests designed to make field testing possible and easy for school officials to detect residue of nicotine, THC, and other controlled substances. SwabTek™ tests are a single-step test that uses dry-reagent chemistry, which is a well-established field-testing process. I also find that SwabTek™ field tests have an adequate degree of reliability and accuracy to make them beneficial in helping school and law enforcement officials investigate e-cigarette incidents. SwabTek™ nicotine and THC detection swab kits are also relatively inexpensive and can be purchased in bulk quantities. I recommend SwabTek™ nicotine and THC detection swab kits for school administrators, school district security, athletic trainers, and school nurses at SFUSD secondary schools.

5. **In order for SFUSD to implement and maintain the customized comprehensive and multi-disciplinary strategies, significant short-term as well as long-term funding will be required.**

The following describes the cost associated with the various recommendations that I find will be required to address the problem of e-cigarette use in SFUSD schools:

a. *Cost of technology*

The cost of the recommended technologies as part of the comprehensive, multi-disciplinary strategy to effectively and properly prevent and address e-cigarette use by students at schools is described below. As detailed above, 28 SFUSD secondary schools recommended for technology-based measures in this report will need vape sensors for school buildings, additional cameras and analytics for school grounds, and access control systems for doors.[151] In order to determine the cost to deploy these technologies that I recommend, a costing analysis was performed by a licensed architect and engineer, Robert Rollo. Mr. Rollo has considerable experience and expertise in cost estimating for large infrastructure projects for school systems. Mr. Rollo has performed a detailed cost estimating analysis for deploying the technologies recommended in this report at each of the secondary schools in the District. Mr. Rollo has

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[151] I note that I did not calculate the cost for certain items in the strategy for SFUSD secondary schools, such as policies, hall-pass approaches and nicotine and THC detection swabs, because these items are either no-cost or relatively low-cost approaches.

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issued a separate written report which details the costs associated with these recommendations.[152]
According to his analysis, the total cost for the technology items recommended for the 28 secondary
schools in SFUSD recommended for technology-based measures in this report is $78,834,213. The
following itemizes the cost for individual technology recommended in this report based on Mr. Rollo's
estimation:

- Vape detection systems for the 28 SFUSD secondary schools: $61,577,739

- The pool of 140 spare wireless, battery operated vape sensors for SFUSD: $109,725 (the per
  unit cost for each sensor is based on Mr. Rollo's unit price of $783.75)

- Smart camera systems for the 28 SFUSD secondary schools: $14,750,562

- Access control systems for difficult-to-supervise areas at the 28 SFUSD secondary schools:
  $2,396,187

  **b. *Cost of additional personnel to support the technology-based measures in the
  comprehensive strategy to effectively and properly prevent and address e-cigarette
  use by students***

  *A fourth theme that emerged from interviews, case studies, the questionnaire, and
  expert panels was the frequent failure of technology as a result of the "human element"
  such as limited staff capacity, lack of training, and lack of funding to faithfully implement
  the intended technology. Examples included lack of staff to monitor video feeds or tip
  lines, staff propping open back doors that were locked, staff leaving radios in their
  classrooms, and the lack of manpower to investigate tips, alleged bullying, or other
  reported threats. Through our discussion with the experts, it became clear that
  technologies are often not implemented as intended, and, therefore, they may not be
  effective because of how they are actually used in the field as opposed to how they were
  intended to be used.[153]*

School safety technology can help make efforts to improve school safety more effective and efficient
and can significantly reduce the need for additional personnel in some instances, but technology should
be viewed as a supplement to rather than a replacement of human efforts. While a primary goal of the
approaches that I recommend has been to carefully develop an array of technologies to address the
impact of e-cigarette use by students at SFUSD without necessitating a substantial increase of new and
costly positions, some additional personnel will be required.

Without proper human support, technology will not work effectively to provide the value required. As
just one example, the installation of cameras and vape detectors alone will not effectively reduce vaping
in SFUSD secondary schools without the assistance of staff to promptly respond to the alerts provided
by those technologies. I therefore recommend an increased level of personnel as an integral part of the
comprehensive approach to address the complex problems resulting from student e-cigarette use. As

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[152] Robert Rollo Vape Mitigation Infrastructure Facility Cost Report, San Francisco United School District.
[153] Heather L. Schwartz et al., "The Role of Technology in Improving K-12 School Safety," RAND Corporation, 2016,
pg. 74.

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with technology enhancements, the types and number of positions for major security technology upgrades varies between school districts depending on various factors such as present staffing levels, extent of the problem of student e-cigarette use, union agreements, and building designs. For the comprehensive, multi-disciplinary strategy that I recommend in this report to work, these personnel staffing costs will be a recurring annual budget item for some school districts for a number of years. I recommend maintaining funding for any new positions created to support the comprehensive, multi-disciplinary strategy to prevent and address students using e-cigarettes at schools for 15 years based on the opinions offered by other experts in this litigation concerning the necessary duration of e-cigarette mitigation strategies.[154]

In addition to supporting the recommended technologies, I find that the District will need additional personnel to address the significant challenges it has encountered in consistently implementing measures to prevent and intervene in student e-cigarette use. As described in detail throughout this report, the relatively sudden, severe, and pervasive level of student e-cigarette use has created substantial overtasking of District personnel. This overtasking has in turn resulted in challenges for SFUSD in its efforts to address the problem of student e-cigarette use effectively and consistently. The additional positions that I recommend will enable SFUSD to consistently perform the many individual tasks required to address the problem of student e-cigarette use such as communicating relevant policies, consequences of violations, reporting requirements and mechanisms, processes, and the available assistance and resources for students, District personnel and parents/caregivers.

The additional personnel will also enable the District to achieve greater consistency in the investigation, documentation and enforcement of e-cigarette policies as well as in how consequences, support and assistance are provided to students caught violating the District's policies pertaining to vaping. These personnel will also be necessary for the District to continually measure, test, and re-evaluate the District's efforts to address student e-cigarette use as described elsewhere in this report.

The following are the types of additional personnel that I believe are needed for SFUSD to effectively address the problem of student e-cigarette use:[155]

i.   E-cigarette Prevention and Intervention Facilitator

As detailed in Safe Havens' Assessment (Section 6), SFUSD currently does not have any personnel dedicated to providing oversight for the District's efforts and focused support for its secondary schools to prevent and address the widespread and serious issue of student e-cigarette use. I have often suggested for school districts experiencing significant school safety threats and risks such as bullying, suicide, and self-harm to have personnel dedicated to focus on these specialty areas based on the scope of the threats and risks, challenges, size of the district, etc.

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[154] *See* Expert Reports of Dr. David Cutler, Dr. Steven Kelder, and Dr. Jonathan Winickoff.

[155] I understand that other experts in this litigation with specialized expertise in youth tobacco use prevention are recommending strategies to address and reduce student e-cigarette use in SFUSD and may be recommending that certain other additional personnel are necessary. My recommendations are limited to the additional personnel that I believe are necessary to implement the technological approach that I have developed. As it relates to the specific issues such as prevention education and counseling and cessations strategies, and the associated costs, I will defer to the recommendations of these experts.

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Since the emerging problem of student e-cigarette use has posed a serious threat and risk to the health and safety of SFUSD students and the learning environment as demonstrated throughout this report, I find that SFUSD will need one new E-cigarette Prevention and Intervention (EPI) Facilitator position. The primary roles of the personnel serving in an EPI Facilitator position would be to help develop, implement, coordinate, and evaluate the District's efforts to more effectively address student e-cigarette use. Examples of the types of tasks the EPI Facilitator will be responsible for include but are not limited to:

- Hiring, training, supervising, and coordinating the work of the new Regional EPI Coordinators, EPI Campus Assistants, EPI Technology System Monitors and EPI Information Technology (IT) Specialists.

- Developing and providing oversight for the budget related to e-cigarette prevention and intervention measures.

- Measurement and fidelity testing of e-cigarette prevention and intervention strategies.

- Overseeing the overall implementation and evaluation of:

    o Awareness training programs for staff, students, and parents.

    o Cessation programs for students who require it due to nicotine addiction.

    o New technologies (such as vape sensors, e-hall-pass systems, etc.).

- Reporting to the District leadership team and school board on the progress of the District's efforts to address student e-cigarette use utilizing available measurement and fidelity testing data.

Based on my review of other current positions of similar duties at SFUSD, I find that position of Central Office Program Administrator at SFUSD is an appropriate and comparable job classification and salary level for the new EPI Facilitator position. Based on the information from the District, the annual cost for the new EPI Facilitator position would be $118,114 per year for salary, plus an additional cost for benefits.

ii.   E-cigarette Prevention and Intervention Coordinators

I find that SFUSD will need EPI Coordinators. Based on the size and complexity of SFUSD as well as the pervasive of student e-cigarette use in the District, I recommend five EPI Coordinator positions for SFUSD. The primary roles of the personnel serving in these positions would be to help develop, implement, coordinate, and evaluate the District's efforts to address the problem of student e-cigarette use at SFUSD schools impacted by vaping. I find that these positions are critical because at present, building administrators, school security, and district-level personnel are currently overtasked by issues associated with e-cigarette incidents and must still maintain the core responsibilities of their traditional job duties. Whether the safety challenge to be addressed involves problems with gang activity, violence with weapons or student e-cigarette use, major enhancements typically require additional personnel for

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effective program implementation and maintenance. Examples of the types of tasks these personnel will be responsible for include but are not limited to:

- Using data and information from student and staff reports, to deploy battery operated wireless vape sensors from the pool of available devices to the EPI IT specialists to address concerns of student e-cigarette use in schools.

- Providing advanced investigative support for e-cigarette violations which result in property damage, serious injury or death.

- Reporting to the EPI Facilitator on the progress of their region's efforts to address student e-cigarette use utilizing available measurement and fidelity testing data.

- Help District and building administrators improve consistency with communicating policies, expectations, signage, and enforcement of student conduct policies.

- Assist building administrators and EPI Technology System Monitors conduct investigations of more challenging and time-consuming vaping incidents.

Based on my review of other current positions with comparable duties or responsibilities at SFUSD, I find that the position of an experienced teacher with a master's degree is an appropriate and comparable job classification and salary level for the new I EPI Coordinator positions. In my experience, this salary level will allow SFUSD to attract and retain qualified personnel to fill these positions. I believe that experienced teachers will be able to communicate effectively with staff, students, administrators, parents, and other caregivers as they have had to do in their roles as classroom teachers. This approach is consistent with what school districts often do for prevention programs, new energy manager positions, and other similar positions.

Based on information from the District for the salary of an experienced teacher with a master's degree, the annual cost for each new Regional EPI Coordinator position would be $48,042.00 per year for salary, plus an additional cost for benefits.

iii. E-Cigarette Prevention and Intervention Campus Assistants

I find that the District does not have adequate personnel to address the need for increased and specialized student supervision in schools where the problem of student e-cigarette use is the most severe in the District. Rather than simply adding positions at each secondary school that reports significant vaping issues, I find that a more practical, effective and sustainable approach would be to utilize a pool of available personnel that can be deployed by the EPI Facilitator to specific schools based on feedback from the EPI Coordinators and the data on student e-cigarette violations, survey data and other data. I have often recommended a similar approach to school districts as a more effective means of human resource allocation than simply adding large numbers of additional safety personnel to each secondary school to address other pervasive concerns such as student weapons violations, gang activity, truancy, etc.

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Based on the size of SFUSD and the fact that the level of student e-cigarette can vary use over time, I find that five of these assistant positions will be needed. Based on my review of other current positions of similar duties at SFUSD, I find that the position of School Monitor at SFUSD is an appropriate comparable job classification and salary level for the new positions. Based on information from the District for the salary of a School Monitor, the annual cost for each new EPI Campus Assistant position would be $41,925.00 per year for salary, plus an additional cost for benefits.

iv.   E-Cigarette Prevention and Intervention Information Technology Specialists

I have found that many school districts do not have adequate staffing for IT personnel to accommodate major upgrades in security technologies comparable to what I recommend for SFUSD. Consistent with my recommendations for many other school districts that I have assessed for significant security technology upgrades, I find that SFUSD will require the addition of two new EPI IT Specialists dedicated specifically to provide oversight for the implementation and maintenance of the new technologies recommended in this report. Based on my review of other current positions of similar duties at SFUSD, I find that the duties of a Security Systems Technician at SFUSD is an appropriate and logical comparable job classification and salary level for the new EPI IT Specialist positions. My recommendation of only two new EPI IT Specialists for SFUSD is very conservative given the size of the District and the amount of additional devices required to address the student e-cigarette problem.

The new EPI IT Specialists will provide the ongoing technical support required for smart cameras, analytic software, vape sensors, and access control recommended for SFUSD in this report. I recommend this staff member work in the IT Department but be supervised by the EPI Facilitator.

Based on information from the District for the salary of a Security Systems Technician, the annual cost for each new EPI IT Specialist position would be $70,406.00 per year for salary, plus an additional cost for benefits.

v.   E-Cigarette Prevention and Intervention Technology System Monitors

I find that the District does not have adequate personnel to perform the real-time live monitoring of e-cigarette prevention and intervention technologies that I recommend in this report. In my experience, adequate coverage is needed from the time of morning arrival until late evening hours when after-school programs are conducted at secondary schools. Additionally, coverage is sometimes needed for situations where high levels of activity justify coverage on weekends. To accomplish necessary coverage, I recommend adding three new EPI Technology System Monitor positions for SFUSD. These new positions will have alternating work hours based on school schedules and special activities. I recommend that the new EPI Technology System Monitor personnel be supervised by the EPI Facilitator.

Based on my review of other current positions with comparable duties or responsibilities at SFUSD, I find that the position of Emergency Communications Operator is an appropriate and logical comparable job classification and salary level for the new EPI Technology System Monitor positions. Based on information from the District for the salary of an Emergency Communications Operator, the annual cost for each new EPI Technology System Monitor position would be $68,562.00 per year for salary, plus an additional cost for benefits.

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c.   The approaches not recommended

While I recommend a wide variety of approaches to be included in this comprehensive strategy for SFUSD, I have also made a conscious effort to recommend only those enhancements that are necessary to address the well-documented negative impact of student e-cigarette use on students and the school environment. My recommendations have built in what I often refer to as "force multipliers" to provide a high degree of protection while reducing the cost of physical upgrades and the need for additional personnel. I have intentionally not recommended additional resources that some SFUSD personnel expressed an interest in because I believe that the array of resources that I do recommend, combined with flexibility in how they can be utilized, will, in my experience, accomplish more with less.

Again, the goal of my recommendations is not to create schools where it is impossible for some students to vape without detection on rare occasions, but instead to create a practical and sustainable comprehensive approach which will make it unlikely that a student could regularly and repeatedly use e-cigarettes on SFUSD school campuses. Therefore, in addition to the recommendations I have included in this report, I also considered and decided against recommending a variety of other potential options for addressing the problem with student e-cigarette use in SFUSD schools. As detailed later in this section, I decided not to recommend those options for a variety of reasons, including but not limited to:

- I determined that the approach (such as entry point metal detection) was not effective, practical, or sustainable.
- I determined that other approaches I have recommended would be more effective, practical, or sustainable.
- I determined that while the approach would be effective, it would not provide enough benefits to justify its cost.
- I determined that even though the approach (such as the renovation of student restrooms incorporating "lazy S" entryways) would be highly effective, it would not be feasible or possible to accurately estimate the cost of the approach.
- I determined that the potential negative impacts as well as the cost of the approach (such as a vape detection canine) would outweigh the benefits it would provide.

The following are some of the options I decided not to recommend in the comprehensive, multi-disciplinary strategy to enable SFUSD to effectively and properly prevent and address student e-cigarette use:

i.   Labor-intensive approaches

While I recommend a relatively modest increase in new positions to support the measures in the comprehensive, multi-disciplinary strategy for SFUSD, I do not recommend the addition of larger numbers of staff even though it was desired by some SFUSD personnel. In my opinion, a blending of policies, practices, and technologies with support from a limited number of staff in the comprehensive strategy I developed for SFUSD will be much more practical, sustainable and effective than labor-intensive approaches. As is my typical approach for other school safety assessment projects, I focused on identifying practical, effective, and sustainable approaches by using a blend of free or low-cost measures, such as policies and practices, combined with the use of technologies supported by a limited

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number of staff. This approach reduces the number of staff needed to address the problem. By using robust technologies, policies, and practices in the strategy for SFUSD, I did not have to recommend the following additional positions:

- School district police officers
- Campus monitors, security officers, or hall monitors assigned to every secondary school campus
- Building administrators
- A vape prevention coordinator for each secondary school

In addition, my recommended approach which uses policies, practices, and technologies when appropriate (such as for improved student supervision) will, in my experience, be more effective than an approach which relies primarily upon large numbers of staff to monitor difficult to supervise areas. While I considered the potential for additional positions based on my area of specialized expertise, other experts in different disciplines may opine on the need for additional personnel in their areas of specialization such as personnel to provide staff development, awareness for students or personnel to provide cessation program services, etc. My opinions in my area of specialization are in no way intended to contradict those who are qualified to opine on the need for additional positions if and as they determine to be appropriate.

ii.   Vape detection canines

I find that in some school districts, the use of vape detection canines can be effective in deterring e-cigarette use if and as appropriate to local conditions. However, I do not recommend this for SFUSD. As an experienced gun detection canine handler, I have found this approach to be highly impactful and effective for street drug, firearm, and explosive detection. I do not, however, recommend this approach for e-cigarette detection in SFUSD due to the high cost associated with the approach and the potential for this measure to decrease student and parental support for the overall comprehensive strategy. This approach requires significant funding for dog purchases, boarding, veterinary bills, support staff, etc. In my experience, the use of detection canines can also create a negative school climate, particularly if used in the presence of students. I also believe that the measures I do recommend, combined with the significant efforts that have already been implemented by SFUSD, will be adequate for the District to address the problem of student vaping without the need for vape detection canines. Therefore, while vape detection canines can be a logical choice for some school districts, this approach is not a logical choice for the size and complexity of SFUSD in light of the other approaches I recommend.

iii.   Walk-through metal detectors

While multiple vendors have suggested the use of walk-through metal detectors to screen students for e-cigarettes, I do not recommend this approach due to (1) the substantial funding required for an effective approach, (2) the challenges created by requiring students to arrive 20-45 minutes early each school day to allow for screening of large numbers of students with only a few checkpoints, and (3) the increased risks of attacks on students who are gathered in large numbers at checkpoints to be screened. In my experience, effective use of metal detectors in K12 schools requires not just the use of metal detectors and properly trained personnel to operate them, but a host of supportive measures to

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prevent students from finding ways to simply bypass the screening checkpoint. A few common examples include students passing through a checkpoint and then opening a side door to obtain contraband from a student after being screened; placing contraband on a restroom window ledge before entering the school, passing through the checkpoint and then retrieving the contraband by opening the window; or bringing contraband into the school during an after-hours event (such as a parent teacher association meeting) when screenings are not conducted and concealing the contraband for later retrieval and use.

I have considerable hands-on experience using both walk-through and hand-held metal detectors for nearly a decade as a practitioner, and I have helped manufacturers improve the devices and equipment as well as how they can be more effectively utilized in K12 schools. Based on my experience, I do not consider the daily use of walk-through metal detectors for the prevention of student e-cigarette possession and use to be an effective, sustainable, or practical approach to this specific problem. I have also helped multiple school districts in various regions of the nation estimate costs for effective entry point metal detection and security X-ray screening programs, and I have found that the cost for an adequate number of staff to provide reasonably effective screening for the detection of firearms typically varies from between $500,000 and $1,000,000 per year per school. The cost to provide a comparable level of effectiveness for e-cigarette screening and detection would be even higher because the sensitivity of the devices would have to be set at much higher levels to detect the significantly smaller amount of metal in most e-cigarettes as compared to firearms. This, in turn, would require far more follow up scans with hand-held metal detectors and more intrusive physical "pat downs" of students because of the number of small metal objects that would set off an alert. Therefore, I do not recommend the use of walk-through metal detectors as part of the comprehensive strategy to enable SFUSD to effectively prevent and address student e-cigarette use at schools.

iv.   Nicotine detection swabs on the hands, face, and/or clothing of a student suspected of using e-cigarettes

I explored the possibility that nicotine swab units could be used to detect trace evidence of vaping on the hands of students suspected of using e-cigarettes. For example, if a vape sensor alerted and five students were observed leaving the restroom as an administrator approached, the use of nicotine swabs on the students' hands could help school officials potentially identify which of the students had been using e-cigarettes. This would be similar to the approach used by TSA agents to deter people from attempting to sneak firearms and explosives through airport security checkpoints. However, I found that the currently available nicotine swabs are not effective for this type of application. I did learn that swabs to detect THC residue will work for this type of application as long as students have not had an opportunity to wash their hands and wipe residue off of their clothing before the swab tests are conducted.

v.   An HID hall-pass system using smart cards

I reviewed an impressive and highly robust e-hall-pass and access control system produced by HID Location Services (https://www.hidglobal.com/rfid-identification-sensing) that uses student identification (ID) cards with proximity smart card technologies. This system can accomplish most or all of the features of web- and phone app-based hall-pass systems as well as provide other helpful features such as automatically sending an alert to school administrators or authorized personnel when a student

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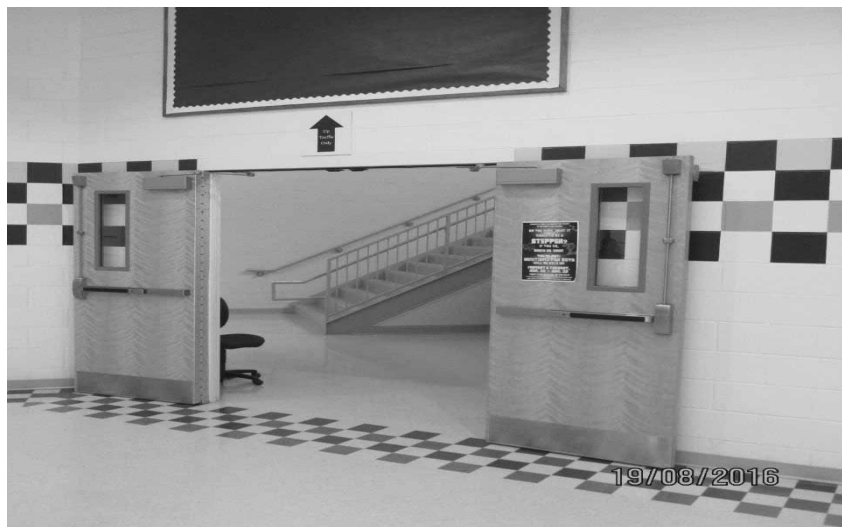*San Francisco Unified School District v. JUUL Labs, Inc. et al.*

deviates from the route to or from the location that the hall-pass was issued for. For example, if a student requests a hall-pass to use the restroom on a particular hallway but then attempts to go to the school cafeteria, an alert will be sent to designated school personnel.

This type of hall-pass system also allows school officials to lock potential trouble areas such as locker rooms, auditoriums, and student restrooms and grant access to those areas to only authorized students who have been issued an e-hall-pass. In an even more advanced approach, this e-hall-pass system can also be integrated with modern smart camera analytic software systems to make it even easier for school personnel to detect abuse of an e-hall-pass. For example, when integrated with the e-hall-pass system, the analytic software will detect a student's deviation from the approved route automatically and will cause the live video feed to pop up as a real-time message on computer monitors, portable phones or even on portable radios with video capability.

With an estimated cost of approximately $200,000 plus an estimated $20,000 recuring annual cost for a single SFUSD high school, even with the many significant advantages of this system over any other available e-hall-pass systems I considered, I cannot recommend this system as practical for SFUSD based on the benefits it offers specific to the problem of student e-cigarette use, particularly in light of the low-cost or no-cost e-hall-pass systems that are available.

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vi. <u>Magnetic holdback devices on hallway fire doors and stairwell doors</u>

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Magnetic holdback devices help keep doors in the open position but will release the doors so they will close automatically if the fire alarm is activated. If and when they can be utilized, I find magnetic holdback devices on doors to be extremely beneficial in enhancing safety, security, and emergency preparedness. The use of magnetic holdback devices allows for hallway, corridor, and stairwell doors to be kept open to increase natural surveillance while still maintaining compliance with fire codes. This helps increase the ability of students and staff to see and hear indications of a safety situation (such as student e-cigarette use, or an overdose related to e-cigarette use) in that area. However, this approach can be costly, and it would not be feasible or possible to accurately estimate the cost of retrofitting this approach into existing buildings as part of my assessment. Therefore, I did not recommend this approach as part of the comprehensive strategy for SFUSD.

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Photo by Michael Dorn

vii.   Some emerging camera analytics

I also considered but am not recommending a number of emerging camera analytics and features that have great promise but are not in my opinion feasible at present. Additionally, the basic analytics that I do recommend in this report offer the most helpful and effective features. One of the analytics currently being developed would utilize depth sensor technology to detect vaping. This analytic would use a future design of smart camera which would act as a 3D camera, analyzing the width, height, area, volume, and more of objects in view. In the case of vaping aerosol, it is likely that this type of system will be able to detect even minor amounts of mist from e-cigarettes. Deploying this approach would require new smart cameras as well as the new analytic. Because the system that I do recommend for SFUSD is open architecture, it will allow for this type of camera to be used if it becomes available.

viii.   Facilities enhancements

There are also a number of facilities enhancements that can be valuable but are difficult to accurately estimate from a cost standpoint and would not provide as much impact as compared to the measures that I am recommending. For example, utilization of the concepts of Crime Prevention Through Environmental Design (CPTED) for future new school construction and major renovation projects would be beneficial to SFUSD. This approach can be costly when renovations are required to implement them, and it would be very challenging to provide accurate cost estimates. While two of the three primary tenants of CPTED are well-suited to help address the challenges posed by e-cigarette use, natural surveillance (i.e., increasing the ability to see and be seen through building designs) and positive territoriality (i.e., increasing the sense of ownership and responsibility among students, staff and parents through visual features such as murals and color schemes), it would be very challenging to provide accurate cost estimates for these two types of enhancements and to justify the expense in relation to other approaches that I recommend. Some examples of the types of CPTED enhancements that could be valuable in addressing student e-cigarette include:

- Reconfiguration of student restroom entryway designs with "lazy S" restroom entryways, which makes it more difficult for students to detect a school staff member entering the restroom due to the sound of the restroom door being opened. This can help deter students from using e-cigarettes in the restroom.

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Photo by Michael Dorn

- Improving positive territoriality through the use of murals, color schemes and other visual physical features. This approach is helpful to create and maintain a positive school climate, especially when security measures (such as security cameras installed in various parts of the school building) are significantly increased. My experience has been that the use of murals, color schemes and other visual features can be very effective in minimizing the potential for an institutional feel resulting from extensive security upgrades.

Photos by Michael Dorn

Each of these physical enhancements are extremely effective examples of CPTED. Multiple studies have found that CPTED has been effective at reducing illicit behaviors in public settings, including K12 schools. My experience supports these research findings. However, accurate cost estimation for many of these potential upgrades can be difficult. As an example, the cost of renovating a single student restroom into a lazy S configuration to improve natural surveillance can vary dramatically due to factors such as

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asbestos abatement, addressing the removal of load bearing walls, or addressing structural issues present due to the proximity of an elevator shaft to a restroom. Therefore, I do not recommend any of these physical enhancements to be included in the comprehensive strategy for SFUSD.

6. **In order for the comprehensive, multi-disciplinary strategy to prevent and address student e-cigarette use at schools to achieve a high degree of effectiveness, SFUSD will need to continually measure, test, re-evaluate, and, if and as needed, make adjustments to the strategy using a structured approach.**

As with other approaches to improve school safety and security, the strategy I developed to enable SFUSD to effectively prevent and address student e-cigarette use will need to be continually measured, tested, re-evaluated, and, if and as needed, adjusted to increase the level of effectiveness and sustainability. Specifically, when SFUSD implements the measures in the recommended strategy, I recommend that the District develop a continual, robust, and structured fidelity testing and measurement approach, which in this context involves the use of various information gathering methods (such as student surveys, data collected from cameras, etc.) to track progress and evaluate various aspects of the implemented measures. As with any major school safety upgrade, it is inevitable that some gaps, inconsistencies, and other opportunities for improvement will occur as the District implements the measures in this comprehensive strategy. This approach will provide a high degree of quality control and will improve the District's capabilities to flex and adjust resources if and when needed to improve how the additional resources are utilized.

For example, if data from the fidelity testing and measurement method show a significant decrease in vaping at one high school but less progress in another school, the data will allow school officials to identify reasons for the differences in outcomes and the adjustments that can be made to improve the effectiveness of the e-cigarette prevention and intervention measures for the school. If the hotspot analysis, tracking analytic software, and student survey data show that some students have identified a new location in a stairwell where they can vape with a low risk of being caught, school officials could make several adjustments such as:

- Using the software features of the vape sensors to adjust the sensitivity of the units in the stairwell.

- Adding wireless and battery operated vape sensors to the trouble spot.

- Adjust the view of the smart cameras covering the problem area.

- Designate the stairwell as a "No Go" or as a "Walking Only" zone for the time(s) of day when violations have been occurring.

- Increase patrols of the problem area by staff during the time period(s) when vaping is reported to occur.

The following are some of the various fidelity testing and measurement methods that SFUSD should use after the implementation of the measures recommended in this report. I note that the additional staffing as part of the comprehensive strategy should, in my experience, provide the District with

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adequate resources to conduct the data gathering and analysis as well as to develop and implement necessary adjustments or changes based on the results of the evaluation and analysis.

Photo by Michael Dorn

a.   Data collected from installed vape sensors

I recommend that the District periodically review the data collected by the vape sensors to track the locations, frequency, and times of the school day where alerts have been received. All three manufacturers of vape sensors recommended in this report offer robust software capabilities to help school officials collect and analysis this type of data. The data results can be used to determine if any adjustments in student supervision, e-hall-pass usage, camera orientation, and vape sensors should be made to make the measures more effective. For example, if there is an unusual delay between the time that a student vapes in an area and when the nearby vape sensor alerts, the sensor can be adjusted to reduce the delay and, if needed, a portable wireless vape sensor can be added.

All three manufacturers of vape sensors I recommend have excellent software to track alerts which can be used to more accurately tune the sensors, and which can help school officials identify patterns of alerts so they can be addressed using additional vape sensors, repositioning of camera angles, enhanced student supervision efforts, the addition of No Go zones or other measures.

b.   Data collected from the e-hall-pass system

E-hall-pass systems can help school officials spot patterns of concerning student hall-pass use that can indicate potential vaping incidents. While this is extremely difficult to accomplish using traditional paper-based hall-pass systems, many e-hall-pass systems automate the tabulation and review of this type of data. For example, one of the common indications of student e-cigarette use at schools is when students repeatedly try to obtain a hall-pass so they can leave the classroom during instructional periods to go to a more difficult to supervise area to vape.

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An e-hall-pass system will make it easier for school administrators, teachers, and other authorized personnel to spot patterns of abuse of hall-passes. If a student frequently asks for a pass, school administrators or teachers can quickly and easily review the data collected from the system and detect this pattern of hall-pass use. For example, a ninth-grade algebra teacher would be able to spot that a student in her class who requests a hall-pass has been issued seven passes in the past two days by different teachers. With a paper-based hall-pass approach, teachers and administrators often fail to spot these types of patterns because it would be too time-consuming for staff to manually record each hall-pass issued, distribute the list to all teachers and to review each teacher's documentation and manually search for unusual patterns.

The information derived from the e-hall-pass system will help school administrators or teachers rapidly spot these types of unusual patterns, so they can investigate to find out if the student who has been asking for so many passes has a legitimate reason. Personnel who are authorized to monitor the school's camera system can also be advised to be alert for unusual behaviors exhibited by students who have been found to be abusing hall-passes. This could help spot attempts by a student who is addicted to nicotine to try to find a location where they can vape regularly. The system also makes it easy for administrators to spot any teachers who are issuing a far greater number of hall-passes than is typical of other teachers in the same school. The school administrators can use this information to help the teachers better understand and comply with the school's established norms regarding when hall-passes should be issued. School personnel should regularly review data from the e-hall-pass system to improve their practices which is possible using the features of the e-hall-pass system I have recommended for SFUSD.

c.   Data collected from analytic software

I recommend that the District periodically review data collected from the analytic software to identify areas of concern and to work with school personnel to improve supervision. For example, the tracking analytic software I have recommended will enable school personnel to identify areas where students are congregating to use e-cigarettes and to identify solutions to increase supervision for those areas (such as adjusting the camera view, assigning staff to supervise the areas during times of concern, or to designate an area as a "No Go" or "Walking Only" zone). This will help school personnel find out if the students have been congregating in the area to use e-cigarettes or for some other reason. These analytics also help school personnel detect new patterns of students gathering in locations and/or at times that are atypical and find ways to address the issue.

d.   Anonymous surveys of students and reported incident data

The District should consider conducting surveys of middle and high school students annually to measure the effectiveness of the implementation of the strategy recommended in this report. Using standardized and defined terms, these surveys should include questions about the prevalence of vaping by students at school. The survey can help school personnel evaluate the effectiveness of and opportunities for improvement in how the recommended strategy is implemented. Survey data should be compared to data relating to e-cigarette policy violations. By comparing and contrasting these two types of data, a clearer picture of the frequency and patterns of e-cigarette use by students can be obtained while also helping to measure progress of the comprehensive prevention and intervention strategy.

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e. **"Hotspot" analysis**

The District should consider conducting hotspot analysis using paper or virtual floorplans of its middle and high schools to obtain feedback from students. In this activity, students are instructed to place visual markers on the school's floorplans to indicate the locations where students have seen or been aware of e-cigarette use. The activity facilitator, who is often a teacher, will identify the "hotspots" which are clusters of markers placed by the students. The facilitator can then ask the students for more information regarding the hotspots, such as the time(s) of day students vape in each hotspot. This type of hotspot analysis can help school personnel identify previously undetected hotspots for student e-cigarette use so they can be addressed. This approach will also help school personnel determine where efforts have been successful so available resources can be focused on those areas where opportunities for improvement still exist. In my experience, students can often identify places to engage in prohibited behaviors, even in schools with highly robust student supervision and student safety efforts. Just as importantly, it has been my experience that this technique is a powerful tool to not only identify "hotspots" but to effectively address them through measures such as moving technology, increasing live supervision, and the use of tools like "Walking Only" and "No Go" zones during specific time periods.

f. **The use of scripted and/or audio scenarios to measure how well school employees understand how to apply policies, procedures, and technology that has been implemented to help prevent and address student e-cigarette use**

In my experience, it is very common for school staff who have been provided with a school district policy to have difficulty applying the policy under actual field conditions. For example, I often find that school staff who have been given a written policy on mandatory child abuse reporting and who have completed a training program on the policy do not know how to properly respond to a scenario depicting an incident which requires staff to notify law enforcement and/or social services as required by statute. I have found this to be true in most school districts when it comes to reporting of threats of violence made by students, bullying, and situations where there are indications that a student is at increased risk of self-harm. As student e-cigarette use is a type of concerning behavior, it is not surprising to me that there is often a disconnect between a school district policy prohibiting possession or use of e-cigarettes, pods, and associated paraphernalia and the ability of staff to understand how to apply the policy under "real-world" conditions in a school.

One method that will help SFUSD more effectively measure how well school personnel understand and consistently apply the district's e-cigarette policy is to periodically conduct scenario simulations with staff to see if they are able to apply the policy correctly to the situations they are presented with. In this activity, a staff member is presented with a scenario related to e-cigarette violations and asked to articulate the actions they would initiate for the hypothetical event. I suggest this activity be done as a timed activity with a set time allotted for staff to respond to each scenario. For example, the staff is told that they have one minute to respond to each scenario. The responses from the participants are used to gauge how well the school district has prepared their personnel to understand and apply the policy to prevent and address e-cigarette use by students.

Like the other approaches in this section, the use of scenarios for fidelity testing does not require a great deal of time but it can provide one of the most accurate ways to measure how well staff can apply

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policies, practices, use technologies, and other important aspects of this comprehensive approach. In my experience, school officials can readily create and properly utilize both scripted and audio scenarios of this type as well as reasonably accurate scoring tools for each scenario.

While SFUSD has been utilizing some of the above approaches, the District has not had the staffing nor technology needed to allow for such an extensive combination of measurement and testing. In my experience, the additional personnel, technologies, and recommended practices will make it possible and practical for the District to measure, test, and evaluate the effectiveness of the recommended strategy as well as to detect and address gaps in the strategy to further tailor and improve it based on local conditions and challenges.